TECHNICAL PROCEDURES
VOLUME FOUR

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Apple Technical Procedures

Volume Four

Table of Contents

	--Title page (contains build date)	-
Monitor II	--Monochrome Monitor Note	06/87
	--Table of Contents	06/87
	--Service Notes	12/86
	--Basics	06/87
	--Take-Apart	04/87
	--Adjustments	04/86
	(except page 3.1)	12/86
	--Troubleshooting	05/84
	(except pages 4.1)	12/86
	(except pages 4.3-4.5)	04/86
	--Illustrated Parts List	04/87
Apple ColorMonitor 100	--Table of Contents	06/87
	--Basics	06/87
	--Take-Apart	08/84
	(except pages 2.1, 2.35)	03/85
	(except page 2.5)	05/86
	(except pages 2.6, 2.9, 2.11)	12/85
	(except pages 2.12, 2.21, 2.22, 2.23)	06/87
	(except pages 2.7, 2.8, 2.10, 2.13)	09/86
	(except pages 2.26-2.29,2.34)	02/85
	--Adjustments	08/84
	(except page 3.9)	02/85
	--Troubleshooting	08/84
	(except page 4.2)	02/85
	--Illustrated Parts List	11/85
	(except pages 5.2, 5.3)	12/86
	(except page 5.4)	07/86
	(except page 5.5)	04/87
Apple IIc Flat Panel Display	--Table of Contents	04/85
	--Troubleshooting	01/85
	--Diagnostics	01/85
	--Take-Apart	01/85
	(except page 3.15)	10/85
	--Illustrated Parts List	10/85
	(except page 4.3)	07/86
Apple Monitor IIc	--Table of Contents	04/85
	--Serial Number Transfer	03/85
	(except page 1.1)	02/86
	--Illustrated Parts List	04/85

Apple ColorMonitor IIe/IIc and AppleColor Composit Monitor IIe/IIc	--AppleColor Composit Monitor Note	06/87
	--Table of Contents	06/87
	--Service Notes	02/86
	(except pages 0.3, 0.8, 0.9)	03/87
	(except page 0.5)	03/86
	--Basics	06/87
	(except page 1.2)	10/85
	--Troubleshooting	12/85
	(except page 2.3)	08/86
	(except page 2.5)	11/86
	--Take-Apart: Series "S"	10/85
	(except page 3S.1)	11/85
	(except pages 3S.3, 3S.31)	11/86
	(except page 3S.7)	05/86
	(except pages 3S10)	01/87
	(except pages 3S.11, 3S.12, 3S.13, 3S.14, 3S.15, 3S.21, 3S.23)	04/87
	(except page 3S.33)	12/85
	--Take-Apart: Series "H"	11/85
	(except pages 3H.1, 3H.8, 3H.11, 3H.12, 3H.14-3H.18)	08/86
	(except page 3H.7)	05/86
	(except pages 3H.13, 3H.19, 3H.27)	03/87
	(except page 3H.29)	02/86
	(except pages 3H.31, 3H.33)	12/85
	--Adjustments	12/85
	(except pages 4.1, 4.7, 4.11, 4.13)	08/86
	--Illustrated Parts List	04/87
	(except pages 5.2, 5.6, 5.8)	10/86
	(except page 5.7)	06/87
	(except pages 5.10)	02/87
	(except page 5.11)	03/86
AppleColor RGB Monitor	--Table of Contents	06/87
	--Basics	06/87
	--Take-Apart	10/86
	(except pages 2.1, 2.10-2.26)	06/87
	--Adjustments	10/86
	(except pages 3.10-3.16)	11/86
	--Troubleshooting	10/86
	--Illustrated Parts List	10/86
	(except page 5.10)	06/87
	(except page 5.11)	04/87
Apple Monochrome Monitor	--Table of Contents	06/87
	--Basics	06/87
	--Take-Apart	10/86
	--Adjustments	10/86
	--Troubleshooting	10/86
	--Illustrated Parts List	10/86
	(except page 5.9)	04/87

Monitor II/Monochrome Monitor ii/e

APPLE MONITOR II/MONOCHROME MONITOR IIe
TECHNICAL PROCEDURES

The platinum version of the Monitor II is called the Apple Monochrome Monitor IIe. Except for the name and the color, the monitors are identical and all procedures are the same for both.

APPLE MONITOR II/MONOCHROME MONITOR IIe
TECHNICAL PROCEDURES

TABLE OF CONTENTS

Section 0 - Service Notes

Power Cord Upgrade Procedure.....0.4

Section 1 - Basics

Product Description.....1.2
Setup Procedure.....1.3
Safety Precautions.....1.4
Discharging the CRT.....1.9
Disposing of the Cathode-Ray Tube (CRT)..... 1.10

Section 2 - Take-Apart

Materials Needed.....2.3
Back Case.....2.3
Filter Board.....2.5
Fuse.....2.7
Main Electronics Assembly.....2.9
CRT.....2.15
Power Switch.....2.19
Power Transformer.....2.21

Section 3 - Adjustments

General Information.....3.3
Yoke Adjustments.....3.3
  Materials Needed.....3.3
  Setup Procedure.....3.5
  Tilt Adjustment.....3.9
  Ring Adjustment.....3.11
  Geometric Adjustments.....3.13
    Pincushion/Barrel Correction.....3.13
    Trapezoidal Correction.....3.13

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Section 3 - Adjustments (continued)

Main Electronics Assembly Adjustments.....3.17
Materials Needed.....3.17
Set-Up Procedure.....3.18
Vertical Adjustments.....3.21
Horizontal Adjustments.....3.25

Section 4 - Troubleshooting

Introduction.....4.3
Symptom Table.....4.3

Section 5 - Illustrated Parts List

Illustrated Parts List and Diagram.....5.1

Apple Monitor II
Technical Procedures

Section 0

Service Notes

Contents:

Power Cord Upgrade Procedure.....0.4

POWER CORD UPGRADE PROCEDURE

In some older versions of the Monitor II, the conductors on the power cord's AC IN connector are not in the proper sequence. These power cords should be replaced whenever found. To identify and replace an old power cord, refer to the procedure below.

WARNING: Before starting, make sure the power cord is unplugged.

1. Remove the back case (**see Section 2, Take-Apart**).

2. Locate the line filter board and power cord. They are located toward the rear on the left side of the chassis.

3. Check the color sequence of the wires from the power cord at the AC IN connector on the line filter board. The proper sequence from top to bottom is **white, black, and green.**

4. If the sequence of wires **is not correct**, replace the power cord (the AC IN connector is part of the power cord assembly) with a newer version power cord that has the correct sequence of wires on its AC IN connector.

5. Check the line filter board to verify that the embossed characters located near the AC IN connector reflect the proper color sequence. If these embossed characters are in the wrong sequence, lightly scratch off the old characters and scribe in the letters reflecting the proper color sequence (W, B, and G top to bottom).

Apple Monitor II/Monochrome Monitor IIe
Technical Procedures

Section 1

Basics

Contents:

Product Description.....1.2
Setup Procedure.....1.3
Safety Precautions.....1.4
Discharging the CRT.....1.9
Disposing of the Cathode-Ray Tube (CRT).....1.10

WARNING: Some older Monitor IIs have the fuse connected to the neutral side of input power. This condition should be corrected.

Refer to the Power Cord Upgrade Procedure in **Section 0, Service Notes**, to identify and correct this condition.

PRODUCT DESCRIPTION

The Apple Monitor II/Monochrome Monitor IIe is a 12-inch CRT display monitor that is used with Apple II or IIe computers. The monitor has a built-in handle for easy carrying. The screen tilts up or down to help reduce screen glare. When the power is on, the power switch (located at the upper right corner) will stay depressed, and the green LED will remain lit.

The contrast control, at the right front, is the only adjustment knob on the front of the monitor. Other user-accessible controls are on the back. They include:

* Brightness control

* Vertical hold

* Vertical size, which lengthens or shortens the vertical height of the picture

The internal controls are used for service adjustments. They include:

* Horizontal width

* Horizontal linearity, which assures that the characters are of uniform width on both sides of the screen

* Horizontal hold, which controls horizontal rolling or tearing on the screen

* Vertical linearity, which assures that the top and bottom characters are the same size

* Focus, which is used to maintain the best overall image on the screen

SETUP PROCEDURE

Follow the steps below to set up the Apple Monitor II/ Monochrome Monitor IIe for use with the Apple II or IIe:

1. Connect one end of the video cable phono plug to the phono jack on the back of the monitor. Connect the other end to the computer's video output phono jack. (Both ends of the cable are the same.)

2. Plug the power cable into a three-hole grounded wall socket.

3. Start up a program that displays some text on the screen.

4. Turn the contrast control clockwise to its maximum. (The contrast control is located on the right front edge of the monitor.)

5. Turn the brightness control clockwise until the fine lines that form the background of the display are clearly visible.

6. Turn the brightness control counterclockwise until the fine lines of the background are just extinguished.

7. Adjust the contrast control to give a pleasing level of text illumination.

8. Adjust the tilt of the screen so that it is perpendicular to your line of vision.

SAFETY PRECAUTIONS

The Apple Monitor II/Monochrome Monitor IIe is harmless as long as you're just watching the display. Removing the cover, however, exposes you to the high-voltage Cathode-Ray Tube (CRT)--the picture tube. The following precautions must be taken to ensure your safety, especially when you are performing live adjustments on the monitor.

Safe Electrical Setup

1. **Be sure your outlet is correctly wired and properly grounded.**

   Polarity and ground testers are available from most electronics stores. Test all outlets in your service area before working on **any** electrical equipment. If you have any doubts about your building's wiring, consult a qualified electrician.

2. **Never use an adaptor plug to connect a monitor's three-prong power plug to a two-prong wall outlet.**

   Adaptors defeat the ground pin, which is a safety feature.

3. **Use an isolation transformer between the monitor and the outlet when performing live adjustments.**

   Order an isolation transformer from your electronics distributor, and make it a practice to use it whenever you are working with **any** charged monitor or other powered system under test. An isolation transformer isolates the circuitry of the system under test from the power company's circuitry, reducing the likelihood of a fatal shock should you simultaneously contact high voltage and anything else that is earth-grounded.

   Do not connect more equipment to the transformer than the wattage capacity of the transformer will bear. (It is usually best to connect only one piece of equipment at a time.) We recommend an isolation transformer with a minimum wattage capacity of 500 VA, with a grounded three-prong cord and receptacle. Two such transformers, available from many electronics stores and distributors, are listed below:

   Triad N-57M Stancor GIS 500

CRT Safety Rules

1. **Do not work on a monitor alone.**

   In case of accident, it could save your life to have someone else nearby. Apple recommends that your staff be trained in Cardio-Pulmonary Resuscitation (CPR).

2. **Remove rings, watches, bracelets, hanging necklaces, and other jewelry before performing repairs on a monitor.**

   Metal jewelry is an excellent conductor of electricity. Removing jewelry will reduce the possibility of electric shock.

3. **Never use a grounding wriststrap or work on a grounded workbench mat when discharging a monitor or when performing live adjustments.**

   Grounding wriststraps, heelstraps, and mats are used to protect sensitive components from the damaging effects of electrostatic discharge from your own body or clothing. Even though they contain a one-megohm resistor and are designed to conduct only small electrical charges, we recommend that they be used **only** when working on "dead" (uncharged) equipment.

4. **Wear safety goggles when working with a CRT.**

   The CRT contains a high vacuum. If cracked or broken, it can implode (collapse into itself, then explode). To protect your eyes from serious injury, always wear safety goggles when working on or near a CRT, and be careful of other people in the area.

5. **Before working inside a monitor, turn off the power and disconnect the AC power cord.**

   Certain parts of a monitor chassis are hot (electrified) when the monitor is under power. Except when you must have the power on (for example, when making live adjustments), never work on a plugged-in monitor--even if you have the power turned off.

6. **Keep one hand in your pocket or behind your back when working on a live monitor.**

   This practice reduces the risk of current passing through your heart, should you accidentally contact high voltage.

7. **Always discharge the anode before touching anything inside the monitor.**

   The anode of the CRT maintains a charge of about 24,000 volts DC (even when the power is off). Before touching any internal components you must discharge this voltage. The anode can regain some charge, even after it has been discharged. If the service procedure takes more than 30 minutes, the anode should be discharged again.

8. **Never touch the anode connector or the anode aperture.**

   Normally the anode aperture (Figure 1, #1) has a connector plugged into it (Figure 1, #2). When a CRT is replaced, the anode connector is removed, exposing the anode. The anode can maintain a charge of several thousand volts (even after the power is off).

9. **Do not pick up or handle a CRT by its neck.**

   To prevent an implosion, you should take every precaution against breaking the tube. Be especially careful with the neck, the area where the tube is the thinnest.

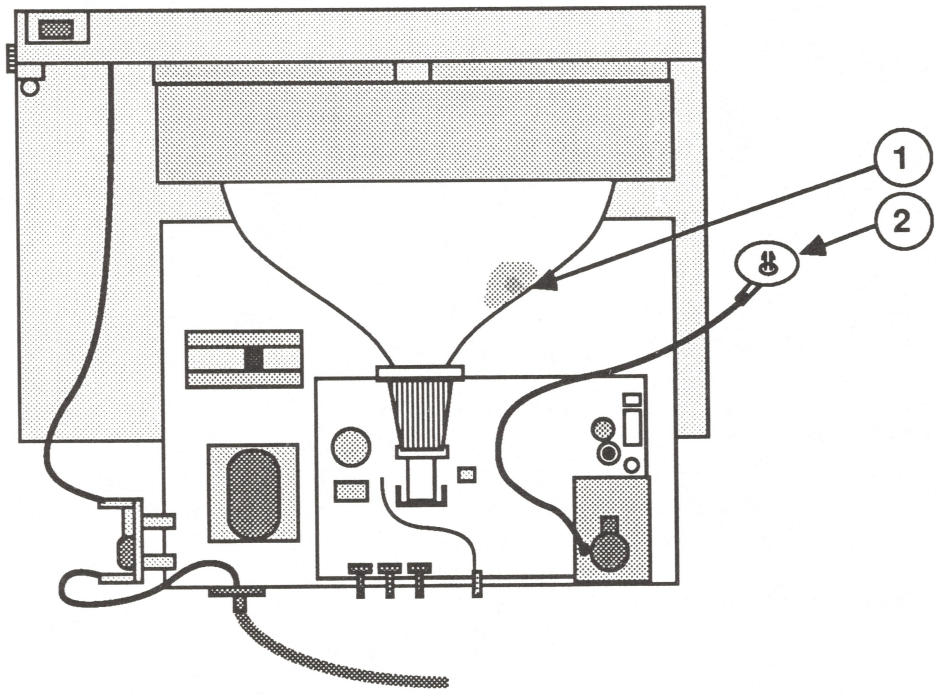

FIGURE 1

Live Adjustment Rules

In addition to the precautions listed on the previous pages, never touch the following components when adjusting a live Apple Monochrome Monitor IIe:

1. The yoke wires (Figure 2, #1)
2. The anode connector (Figure 2, #2)
3. The anode wire (Figure 2, #3)
4. The flyback transformer (Figure 2, #4)

WARNING: Serious injury could result if you touch any of these components with the power on.

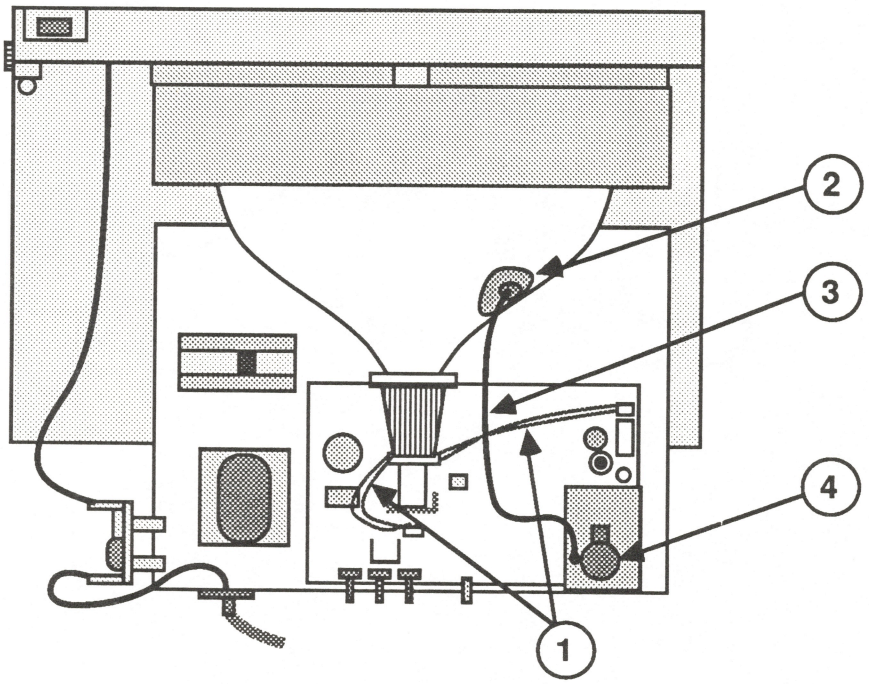

FIGURE 2

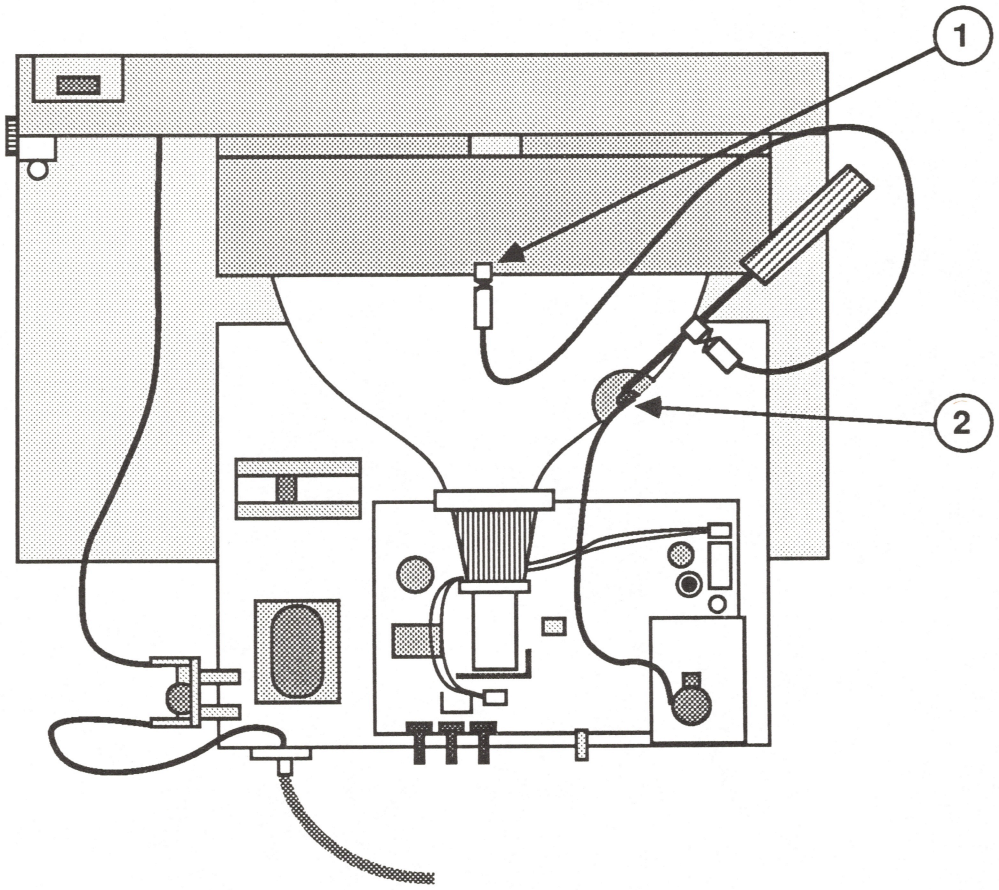

FIGURE 3

DISCHARGING THE CRT

Materials Required

Safety goggles
CRT discharge tool **OR** a 6-inch flathead screwdriver and a 12-inch cable with alligator clips

1. Turn off the monitor and disconnect the AC power cord.

2. Remove the back cover (see **Section 2, Take-Apart**).

3. Remove any rings, wristwatches, bracelets, or grounding wriststraps.

4. Put on safety goggles.

5. Attach a clip of a CRT discharge tool to the metal chassis. **OR** attach one end of an alligator lead to a long flatblade screwdriver, two inches from the insulated handle. Attach the other end to any part of the metal chassis surrounding the CRT. (Figure 3, #1).

   WARNING: Use only <u>one</u> hand while discharging the CRT. Grasp only the insulated handle of the CRT discharge tool or screwdriver while discharging the CRT.

6. Slide the tip of the CRT discharge tool or the screwdriver under and toward the center of the anode cap (Figure 3, #2) until it contacts the metal anode ring.

   CAUTION: Do not use force. If you are using a screwdriver and it is difficult to get it under the anode cap, use a smaller screwdriver to loosen the suction of the anode cap on the tube. Then use the larger screwdriver to discharge the anode.

7. Remove the CRT discharge tool or the screwdriver and alligator clips.

8. Peel back the anode cap until you can see the anode ring at the center. Notice how the metal connector in the center of the cap is clipped into the CRT. Push on the cap in one direction and lift the cap off the tube.

NOTE: A secondary charge can build up even after you have discharged the CRT. To dissipate that charge, establish a ground lead by fastening one alligator clip to the metal chassis and the other clip to the edge of the anode aperture.

DISPOSING OF THE CATHODE-RAY TUBE (CRT)

WARNING: Remember that a CRT can implode unless it is devacuumed. Putting a defunct CRT into a trash receptacle without devacuuming it can endanger other people.

Materials Required

Thick cardboard box large enough to conceal the CRT
Large, sharp diagonal cutters
Large pliers
Duct tape
Safety goggles
Gardening gloves
12-inch square of cloth or heavy paper

Devacuuming the CRT

1. Put on the safety goggles.

2. In the side of the box about six inches from the bottom, cut or drill a hole just large enough to accommodate the very tip of the CRT.

3. Place the CRT inside the box with the tip of the neck protruding through the hole, and tape the box flaps down with duct tape (Figure 4).

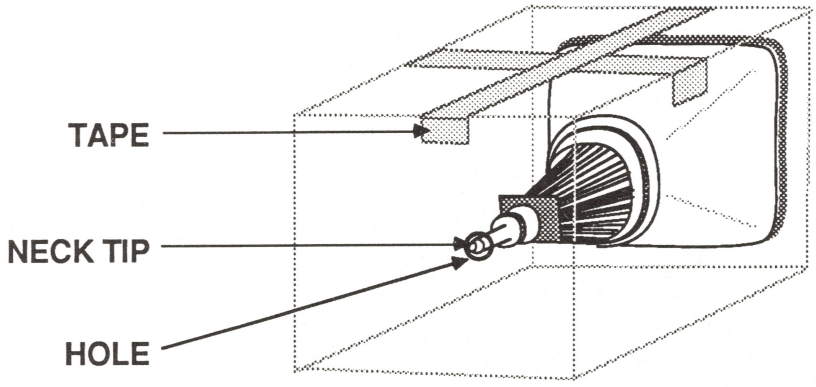

FIGURE 4

WARNING: Only the very tip of the CRT neck should be protruding through the hole in the box. The box must not have any other openings.

4. Put on the gloves.

5. Pull off the black plastic guide located at the end of the CRT neck. Using the diagonal cutters, carefully clip off the connector pins on the end of the CRT neck.

6. Tape the piece of cloth or paper onto the box (Figure 5, #1) so that it forms a veil over the opening (Figure 5, #2) but allows your hand access to the tip of the CRT. The veil's purpose is to catch the bits of glass that may fly during the following step.

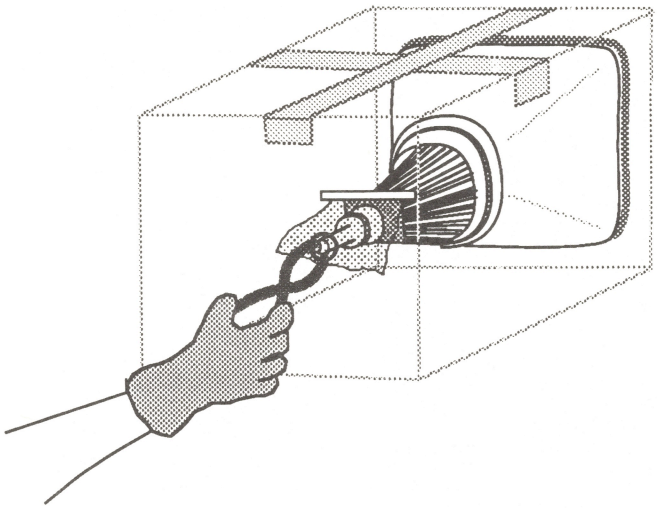

FIGURE 5

7. Make sure no one is standing nearby. Place the pliers under the veil, stand to one side, and look away while you use the pliers to snip off the exposed tip of the CRT (see Figure 5).

   WARNING: Do not look directly at the box when cutting off the tip!

   You will probably hear a rush of air entering the CRT when the CRT vacuum breaks--but even if you don't, the procedure is complete if the inner space of the CRT is clearly visible through the opening created by the removed tip.

Monitor II Technical Procedures

Section 2

Take-Apart

Contents:

Materials Needed.....2.3
Back Case.....2.3
Filter Board.....2.5
Fuse.....2.7
Main Electronics Assembly.....2.9
CRT.....2.15
Power Switch.....2.19
Power Transformer.....2.21

WARNING: Some older Monitor II power cord conductors are not in the proper sequence, causing a potential safety problem (to the service technician only). When you open a Monitor II for repair, check to make sure the cord wiring sequence is correct. If it is not, **replace the cord before you service the product.** (For identification and installation instructions, see "Power Cord Upgrade Procedure" in **Section 0, Service Notes**).

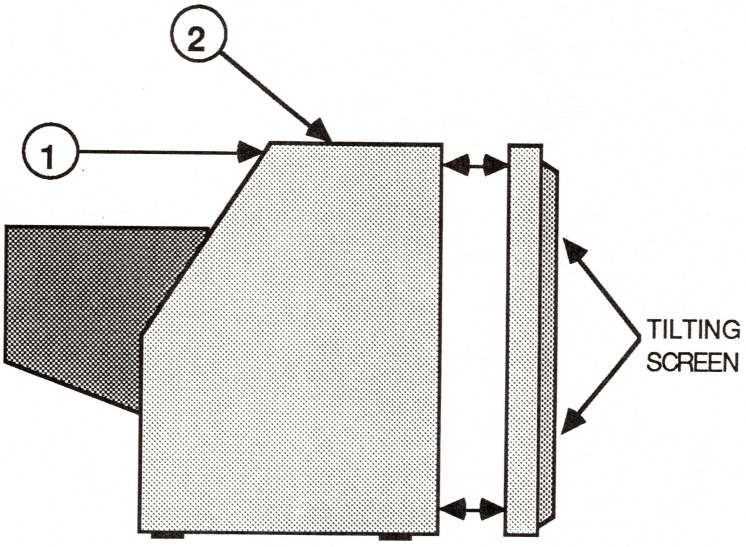

FIGURE 1

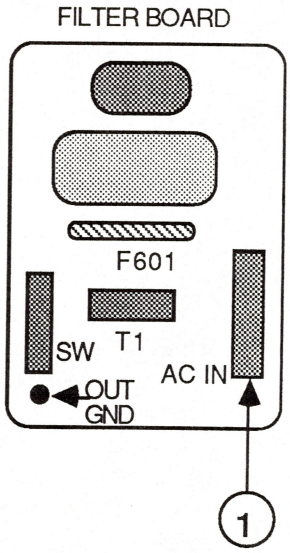

FIGURE 2

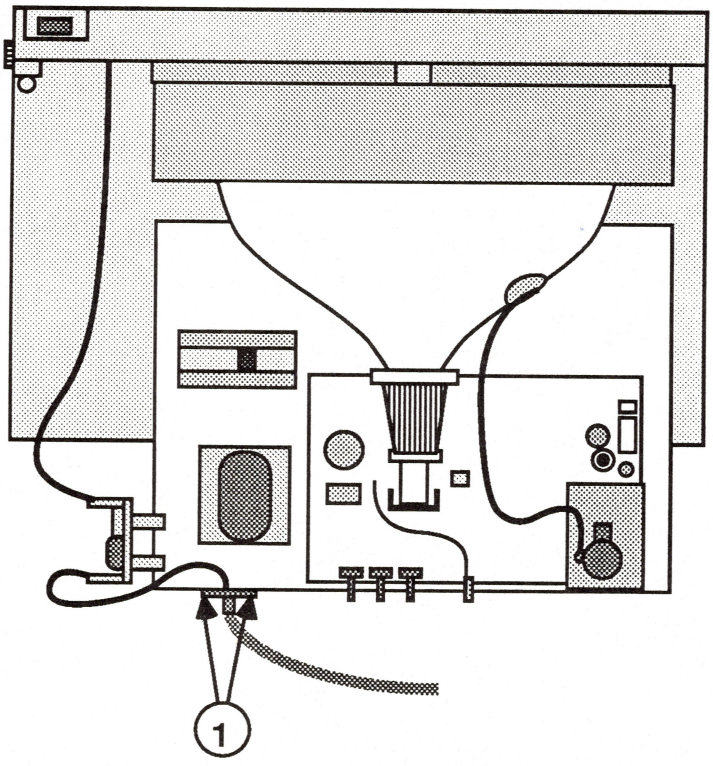

FIGURE 3

MATERIALS NEEDED FOR TAKE-APART PROCEDURES

Medium Phillips screwdriver (magnetic)
Diagonal cutters
12-inch jumper wire (with insulated alligator clips)
Small flatblade screwdriver
Medium long-nose pliers
Exacto knife
Soldering iron and solder

BACK CASE

Remove:

1. Disconnect the AC cord from the wall outlet.

2. Place the monitor on its side and remove the five Phillips screws from the bottom.

3. Set the monitor upright and remove the two screws from the handle recess (Figure 1, #1).

4. Slide the back case away from the frame (Figure 1, #2).

5. Pull the power cord through the opening in the back case. (If the plug is too large to fit through the opening in the back case, go on to step 6.)

6. **DISCHARGE THE CRT.** (See "Discharging the CRT" in **Section 1, General.**)

7. For some service procedures, it is not necessary to remove the power cord. If you **are** going to remove it, disconnect the plug at AC IN on the small filter PCB (Figure 2, #1), remove the two screws from the cord mounting plate (Figure 3, #1), remove the tie wrap, and withdraw the wires through the hole in the chassis.

WARNING: Some older Monitor II power cord conductors are not in the proper sequence, causing a potential safety problem (to the service technician only). When you open a Monitor II for repair, check to make sure the cord wiring sequence is correct. If it is not, **replace the cord before you service the product.** (For identification and installation instructions, see "Power Cord Upgrade Procedure" in **Section 0, Service Notes**).

Replace:

To reinstall the back case and power cord, follow the procedure described above in reverse order.

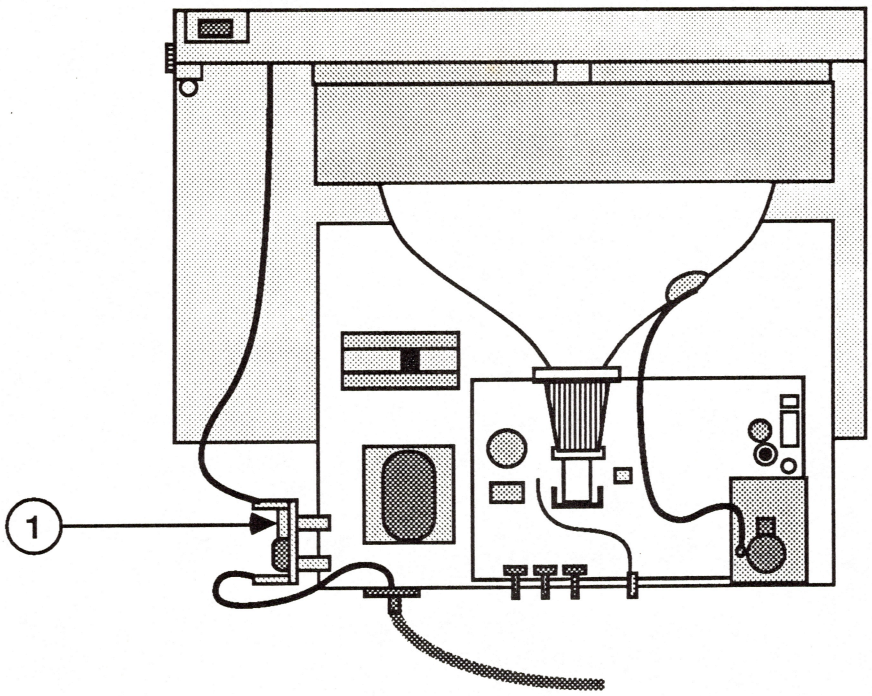

FIGURE 4

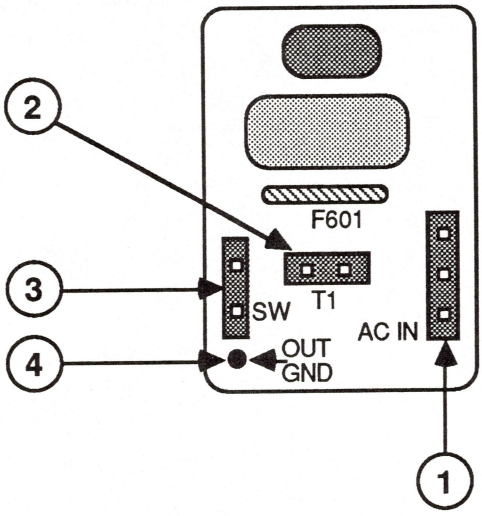

FIGURE 5

FILTER BOARD

WARNING: Some older Monitor II power cord conductors are not in the proper sequence, causing a potential safety problem (to the service technician only). When you open a Monitor II for repair, check to make sure the cord wiring sequence is correct. If it is not, **replace the cord before you service the product.** (For identification and installation instructions, see "Power Cord Upgrade Procedure" in **Section 0, Service Notes**).

Remove:

The filter board is located along the rear side of the chassis (Figure 4, #1). To remove the filter board:

1. Unplug the power cord.
2. Remove the back case. (See "Back Case - Remove.")
3. **DISCHARGE THE CRT.** (See "Discharging the CRT" in **Section 1, General.**)
4. Remove the three connectors from the filter board: AC IN, T1, and SW (Figure 5, #1, 2, and 3).
5. Remove the Phillips screw that holds the board to the chassis. (Hold the hex nut on the back side of the screw with the long-nose pliers.)
6. Unsolder the green ground wire (Figure 5, #4).

Replace:

1. Solder the green ground wire to the filter board where it is marked "OUT GND" (Figure 5, #4).
2. Remount the filter board to the chassis bracket using the Phillips screw and hex nut.
3. Plug in the three connectors SW, T1, and AC IN. Be careful with SW and T1 -- both are two-prong plugs and can be put on the wrong posts. T1 comes from the transformer and SW comes from the power switch. Be sure to orient T1 correctly: the black lead should go on the left and the white lead should go on the right as you face the board. The board is marked B and W for this plug.

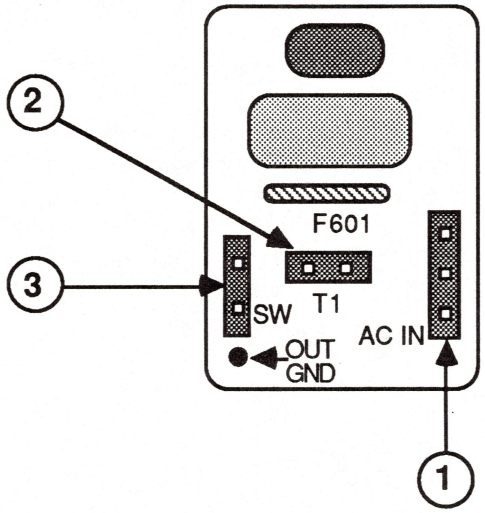

FIGURE 5A

FUSE

NOTE: Newer models of the Monitor II have clip-in fuse holders and do not require unsoldering or removal of the filter board to change the fuse.

If the fuse is open (the wire inside is broken) it must be replaced. To replace the fuse:

1. Unplug the power cord.

2. Remove the back case. (See "Back Case - Remove.")

3. **DISCHARGE THE CRT.** (See "Discharging the CRT" in **Section 1, General.**)

4. Remove the three connectors from the filter board: AC IN, T1, and SW (Figure 5A, #1, 2, and 3).

5. Remove the Phillips screw that holds the board to the chassis. (Hold the hex nut on the back side of the bolt with the long-nose pliers.)

6. Unsolder both ends of the fuse wires from the board and lift the fuse from the board. (This type of fuse is called a pigtail fuse.)

   NOTE: This step is easier if you use a solder sucker to remove the excess solder and some kind of holder (vise grips) to hold the board while you're working on it.

7. Select the correct fuse: for a 115V unit, use a .5-amp fuse; for a 230V unit, use a 1-amp slow-blow fuse. Install the fuse into the wire holes and resolder the leads. Clip off any excess from the leads after soldering.

8. Remount the filter board to the chassis bracket using the Phillips screw and hex nut.

9. Plug in the three connectors SW, T1, and AC IN. Be careful with SW and T1 -- both are two-prong plugs and can be put on the wrong posts. T1 comes from the transformer and SW comes from the power switch. Be sure to orient T1 correctly: the black lead should go on the left and the white lead should go on the right as you face the board. The board is marked B and W for this plug.

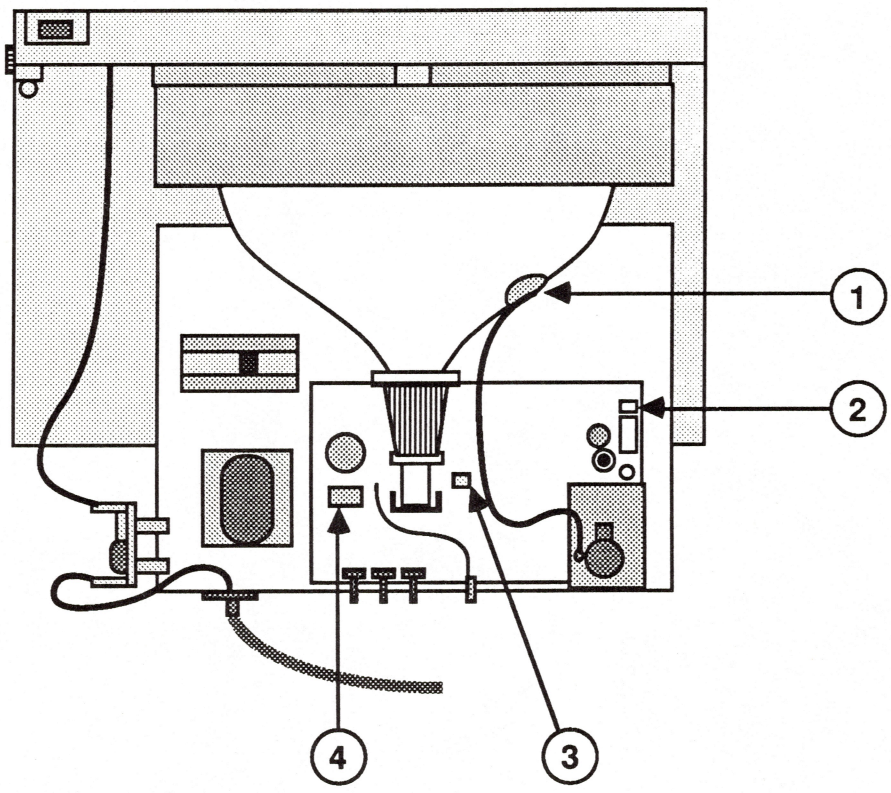

FIGURE 6

MAIN ELECTRONICS ASSEMBLY

WARNING: The anode of the Monitor II retains a high-voltage charge even after the power is turned off. To protect yourself from injury, always power off the Monitor II and discharge the anode before continuing with these procedures.

Remove:

1. Remove the back case. (See "Back Case - Remove.")

2. **DISCHARGE THE CRT.** (See "Discharging the CRT" in **Section 1, General.**)

3. Remove the anode wire (Figure 6, #1) by peeling back the rubber cup, using long-nose pliers to squeeze the metal clip together, and pulling it out. Then place the Monitor II on a grounded workbench pad and put on your grounding wriststrap. (Never do this until after the Monitor II has been discharged.)

NOTE: Before performing the following steps, pull the chassis tray toward the back of the unit. The components are more accessible with the chassis pulled back as far as the wires allow.

4. Disconnect the brown/gray wire from position H-DY at the front right corner of the main electronics assembly (Figure 6, #2) and the green/white wire from position V-DY at the center of the main electronics assembly (Figure 6, #3). Cut all the tie wraps along these wires.

5. To free the ground wire, remove the screw from the mounting tab at the upper right corner of the CRT.

6. Disconnect the two red leads at location T2 near the left rear edge of the main electronics assembly (Figure 6, #4).

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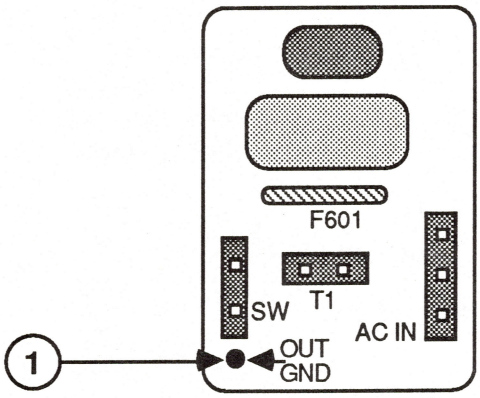

FIGURE 7

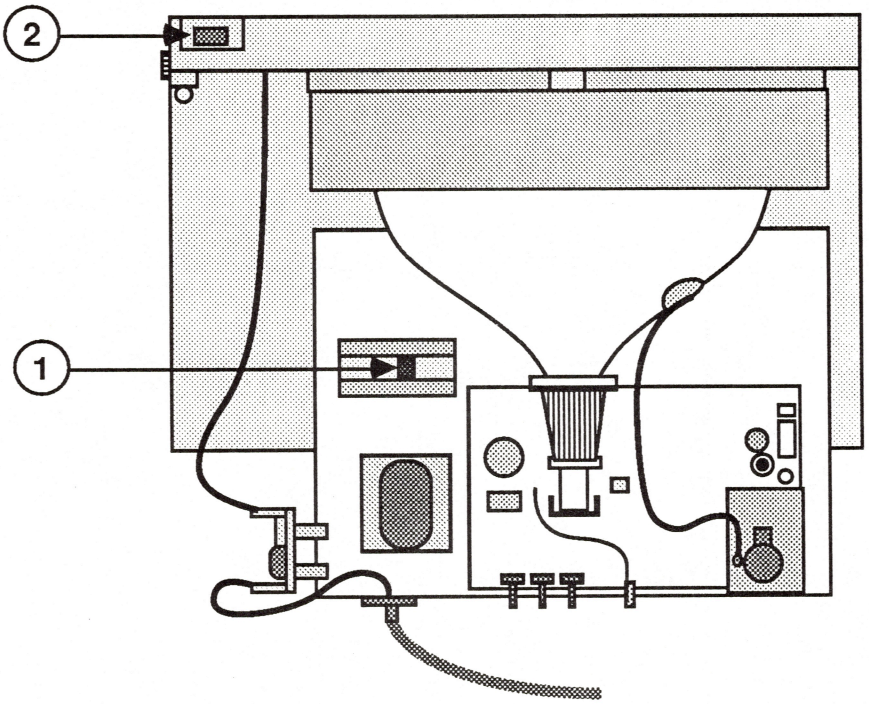

FIGURE 8

7. Unsolder the green ground wire from the small filter PCB at OUT/GND (see Figure 7, #1).

NOTE: It might be easier to get at the solder on the back side if you remove the filter board from the chassis.

8. Remove the one LED mounting screw and the two contrast control mounting screws located along the left front case (see Figure 8, #2). These two parts will remain attached to the main electronics assembly. Cut all tie wraps along these wires.

9. Disconnect the 3-wire connector from the transistor in front of the transformer (see Figure 8, #1).

10. Disconnect the socket on the end of the CRT.

11. Remove the two screws that attach the RCA phono jack to the chassis.

12. Remove the five mounting screws from the main electronics assembly.

NOTE: The mounting screw at the right rear of the main electronics assembly also holds the flyback transformer shield, and glue has been used to strengthen the connection between this corner of the main electronics assembly and the undermounting. After removing the screw, remove the transformer shield, then loosen the glue under the corner of the main electronics assembly by sliding an X-acto knife between the PCB and the undermounting. **Any attempt to lift the PCB before the glue has been loosened will result in a broken corner, rendering the main electronics assembly worthless.**

13. The main electronics assembly can now be removed by sliding it forward one inch (allowing the knobs to clear the chassis) and lifting up.

Replace:

1. Mount the main electronics assembly on the sliding chassis, making sure the three stems from the pots fit through the holes in the chassis. Secure the board with the five screws. Make sure that the shield is mounted around the flyback transformer, with the mounting screw at the main electronics assembly's right rear.

2. Replace the phono jack.

CONTINUED ON NEXT PAGE

3. Replace the CRT socket.

4. Connect the 3-wire connector to the transistor. **The correct orientation places the red wire towards the back of the monitor and the yellow wire towards the front.**

   NOTE: A backwards connection results in a wavy screen and overheating of the regulator.

5. Reconnect the LED and the contrast control on the front case.

6. Solder the green ground wire from the main electronics assembly to the filter board. (If you removed the filter board, remount it at this time and connect any wires that were removed.)

7. Connect the two red leads from the transformer to connector T2 on the main electronics assembly.

8. Connect the black ground lead from the main electronics assembly to the upper right corner of the CRT mounting screw.

9. Connect the two pairs of wires from the yoke to the main electronics assembly. The green/white wire connects to the V-DY connector, and the brown/gray wire to the H-DY connector.

10. Reconnect the anode cap to the anode of the CRT, making sure that both metal clips are in correctly.

NOTE: When a new main electronics assembly is installed, it is possible that the horizontal or vertical circuits will need adjustment. See **Section 3, Main Electronics Assembly Adjustments.**

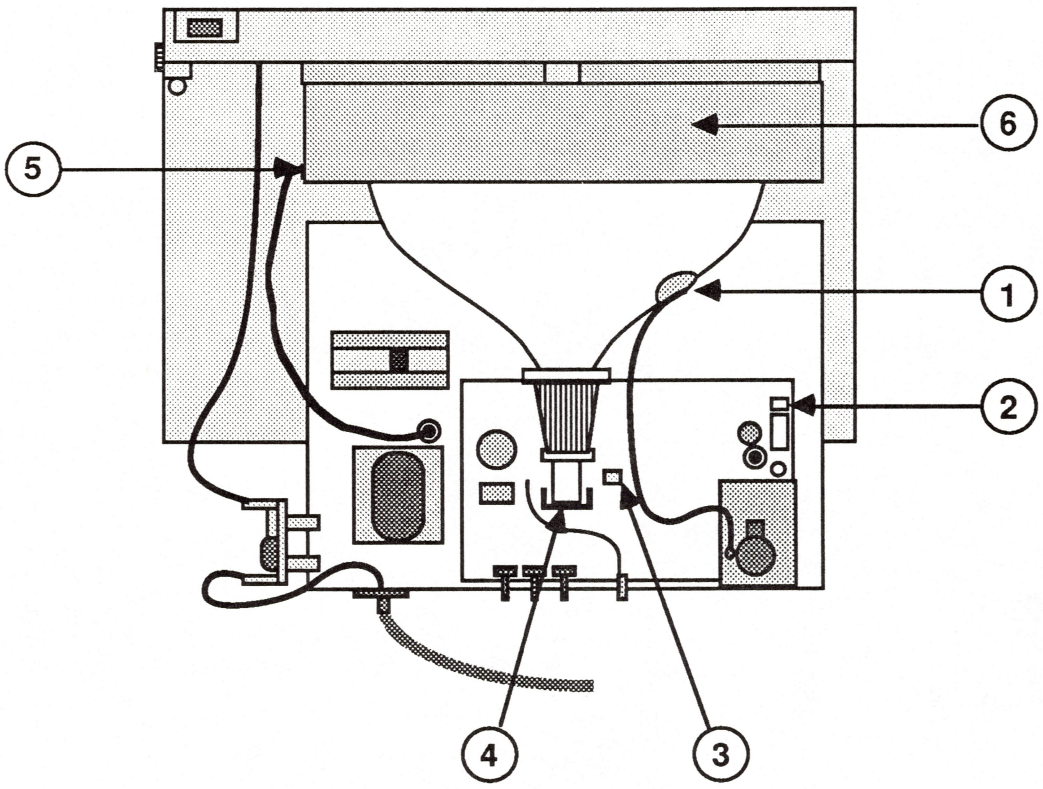

FIGURE 9

CATHODE RAY TUBE (CRT)

WARNING: The anode of the Monitor II retains a high-voltage charge even after the power is turned off. To protect yourself from injury, always power off the Monitor II and discharge the anode before continuing with these procedures.

Remove:

1. Remove the back case. (See "Back Case - Remove.")

2. **DISCHARGE THE CRT.** (See "Discharging the CRT" in **Section 1, General.**)

3. Remove the anode wire (Figure 9, #1) by peeling back the rubber cup, using long-nose pliers to squeeze the metal clip together, and pulling it out. Then place the Monitor II on a grounded workbench pad and put on your grounding wriststrap. (Never do this until after the Monitor II has been discharged.)

NOTE: Before performing the following steps, pull the chassis tray toward the back of the unit. The components are more accessible with the chassis pulled back as far as the wires allow.

4. Disconnect the brown/gray wire from position H-DY at the front right corner of the main electronics assembly (Figure 9, #2) and the green/white wire from position V-DY at the center of the main electronics assembly (Figure 9, #3). Cut all the tie wraps along these wires.

5. Disconnect the socket board (Figure 9, #4) from the neck of the CRT.

6. Remove the screw (Figure 9, #5) that secures the black ground wire to the left side of the top ground shield.

7. Remove the five screws that hold the top ground shield (Figure 9, #6) to the front case, and remove the top shield.

8. Remove the two bottom mounting screws on the CRT (one at each corner).

CONTINUED ON NEXT PAGE

9. Support the CRT with one hand and remove the top CRT mounting screws. On the top right side there is an antistatic shield finger plate that will also come off. (Avoid touching the anode opening.)

10. When all four mounting screws have been removed, gently lift out the CRT. If the CRT is hard to get out, hold the back end of the tube with one hand and gently push on the front of the tube with the other hand.

11. The yoke assembly can be removed from the CRT by loosening the clamp screw and sliding the yoke off to the rear. It may be necessary to cut through the adhesive at the front of the yoke.

Replace:

1. Insert the tube into the front frame, aligning the four mounting screws. Screw the top left hand mounting screw in first, and then the top right screw, making sure the antistatic shield finger plate is in place (it should touch the tube), and that the black ground wire from the right side of the main electronics assembly is also attached to the screw. Then put in the two bottom screws.

2. Slide in the chassis tray.

3. Reinstall the top ground shield that mounts to the front case with the five screws. Then attach the black ground wire from the left side of the main electronics assembly to the left side of the top shield.

4. Install the socket on the back of the CRT.

5. Connect the green/white wires from the yoke to the V-DY connector near the middle of the main electronics assembly, and the brown/gray to the connector near the front right corner of the PCB.

6. Reinstall the anode lead on the tube.

7. Tie wrap the wires that are in groups, making sure that the chassis tray can slide all the way in and out without the wires binding.

NOTE: If the yoke had been removed or replaced, an adjustment might be necessary. See **Section 3, Yoke Adjustments.**

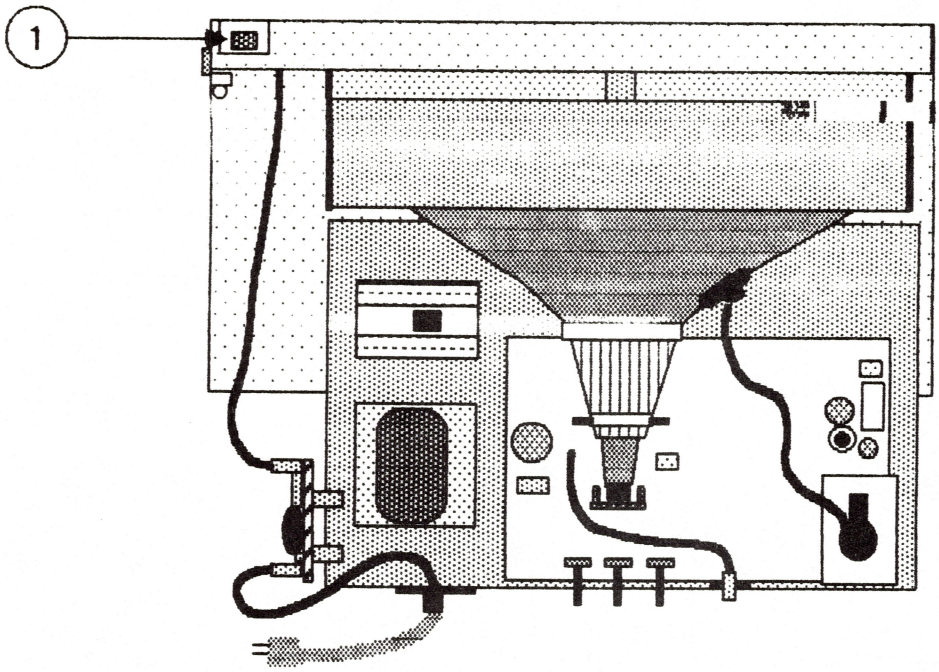

FIGURE 10

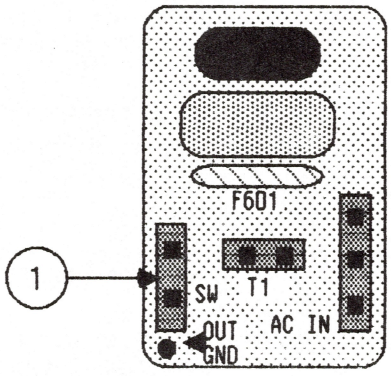

FIGURE 11

POWER SWITCH

Remove:

1. Remove back case. (See "Back Case - Remove.")

2. **DISCHARGE THE CRT.** (See "Discharging the CRT" in **Section 1, General.**)

3. Place the Monitor II on a grounded workbench pad and put on your grounding wriststrap. (Never do this until after you have discharged the CRT.)

4. Remove the two (2) screws that mount the switch (Figure 10, #1).

5. Cut the tie wrap on the switch, power cord, and transformer wires.

6. Disconnect the switch leads from the filter PCB (Figure 11, #1).

Replace:

To install the power switch, follow the above procedure in reverse order.

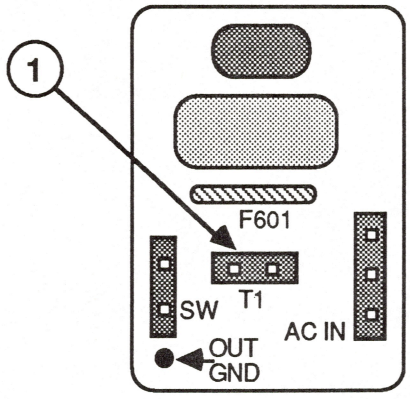

FIGURE 12

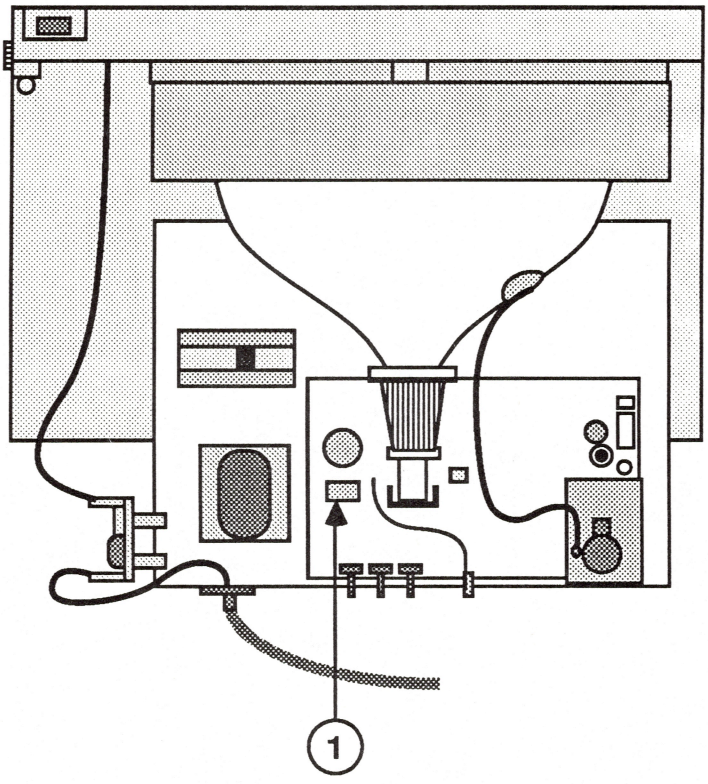

FIGURE 13

POWER TRANSFORMER

Remove:

1. Remove back case. (See "Back Case - Remove.")
2. **DISCHARGE THE CRT.** (See "Discharging the CRT" in **Section 1, General.**)
3. Place the Monitor II on a grounded workbench pad and put on your grounding wriststrap. (Never do this until after you have discharged the CRT.)
4. Disconnect the black and white pair of wires at T1 on the filter board (Figure 12, #1).
5. Disconnect the red pair of wires located at T2 on the rear edge of the main electronics assembly (Figure 13, #1).
6. Remove the two transformer mounting screws.
7. Remove the transformer from the monitor.

Replace:

To install the power transformer, follow the above procedure in reverse order.

Monitor II Technical Procedures

Section 3

Adjustments

Contents:

General Information.....3.3
Yoke Adjustments.....3.3
  Materials Needed.....3.3
  Set-Up Procedure.....3.5
  Tilt Adjustment.....3.9
  Ring Adjustment.....3.11
  Geometric Adjustments.....3.13
    Pincushion/Barrel Correction.....3.13
    Trapezoidal Correction.....3.13
Main Electronics Assembly Adjustments.....3.17
  Materials Needed.....3.17
  Set-Up Procedure.....3.18
  Vertical Adjustments.....3.21
  Horizontal Adjustments.....3.25

WARNING: Some older Monitor II's have the fuse connected to the neutral side of input power. This condition should be corrected.

Refer to the Power Cord Upgrade Procedure in **Section 0, Service Notes**, to identify and correct this condition.

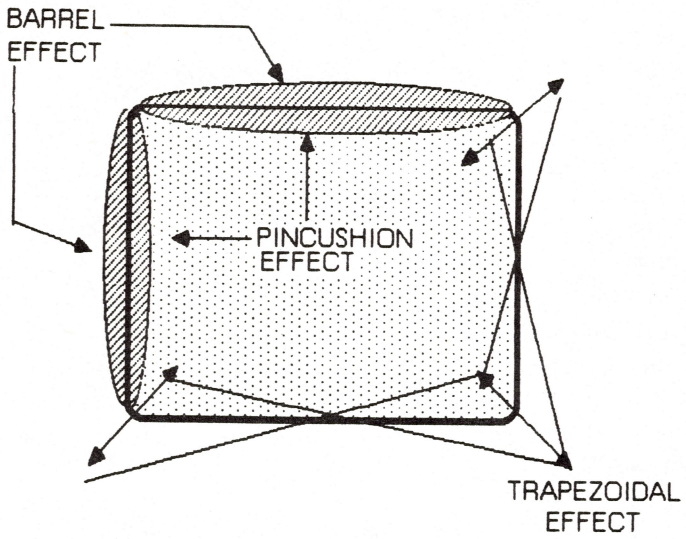

FIGURE 1

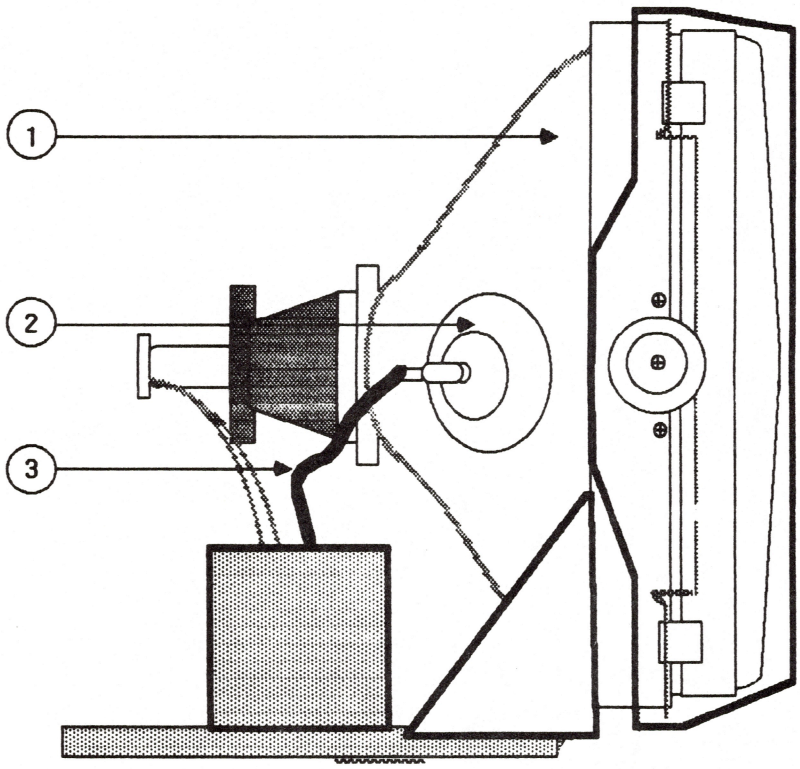

FIGURE 2

GENERAL INFORMATION

NOTE: The Monitor II should be tested with the Apple II Peripherals Diskette. (See **Multi-Product Diagnostics Technical Procedures, Section 1.**)

One source of test patterns is not necessarily better than another. The advantage of the Peripherals Diskette is that it can be used with a greater number of systems.

YOKE ADJUSTMENTS

The following procedures are used to adjust the yoke assembly, when necessary, after yoke or CRT replacement. There are three major adjustments that might be needed, depending on whether the picture is tilted, not centered, or geometrically distorted (see Figure 1). They are the tilt adjustment, the centering adjustment, and the geometric adjustment. In some cases, all three adjustments might be needed.

Materials Needed

Monitor II
Apple II, II Plus, or IIe
Medium Phillips screwdriver
Flexible 12-inch ruler
Apple II Peripherals Diskette
  or IIe Diagnostic ROM card.
Washable fine point marking pen

CAUTION: THERE ARE EXTREMELY HIGH VOLTAGES ON THE TUBE, THE ANODE, AND THE ANODE LEAD. IN THESE ADJUSTMENTS YOU WILL BE PUTTING YOUR HAND NEAR THESE VOLTAGES. YOU MUST WATCH WHAT YOU ARE TOUCHING OR ADJUSTING ON THE YOKE ASSEMBLY OR INJURY CAN RESULT. AVOID TOUCHING THE TUBE, ANODE, AND ANODE LEAD (SEE FIGURE 2, #1, 2, AND 3). NEVER HOLD ON TO THE CHASSIS WITH YOUR OTHER HAND WHILE MAKING THESE ADJUSTMENTS. PUT YOUR OTHER HAND IN YOUR POCKET OR BEHIND YOUR BACK WHILE MAKING THESE ADJUSTMENTS.

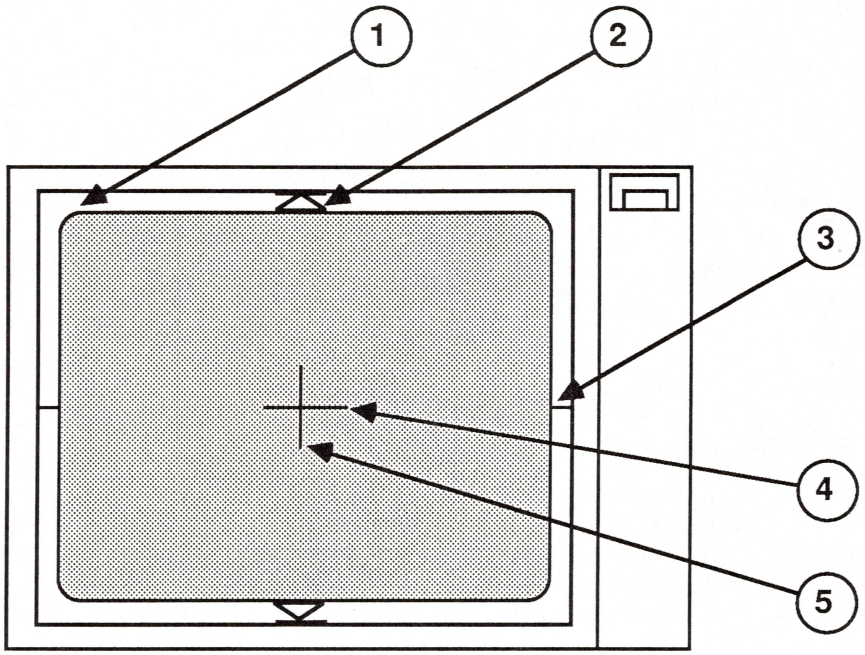

FIGURE 3

Set-Up Procedure

1. In order to have some point of reference for centering the image, mark the screen with a washable marker in the following manner:

   a) On the edge of the bezel (the movable part that holds the CRT and tilts up and down - Figure 3, #1), measure half way down from the top (approximately 4 1/4 inches) and make a pencil mark on each side of the bezel (see Figure 3, #3).

   b) Take the flexible ruler and put each end of it on the marks on the bezel. Push the center of the ruler onto the screen and make a 2-inch line on the center of the screen (see Figure 3, #4).

   c) Next, find the two molded markings on the top and bottom of the bezel that look like triangles (see Figure 3, #2). These lines mark the vertical center of the screen.

   d) Put the ruler ends on the center of the triangles and push the center of the ruler against the middle of the screen.

   e) Make a vertical line along the edge of the ruler (see Figure 3, #5); it should intersect with the horizontal line you drew earlier, resulting in a cross (+) on the screen.

2. Remove the Monitor II case (see **Take-apart** section).

3. Connect the video cable from the Monitor II to the Apple II, II Plus, or IIe.

4. If you are using the Apple II Peripherals Diskette, do the following:

   a) Insert the diskette in the disk drive.

   b) Power up the system.

   c) Select "Monitor Tests" from the menu, and choose Test #1 (Dot Pattern).

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5. If you are using the IIe Diagnostic ROM card, do the following:

   a) Insert the ROM card into slot 1 or 2 of the IIe.

   b) Make sure the switch on the top of the card is pointing to the rear of the system.

   c) Power up the system.

   d) Select the Video Tests (V) from the menu.

   NOTE: If the menu does not appear when the power is turned on, and the disk drive continues to whirl, the switch on the Diagnostic ROM card is in the wrong position. Power off the system, change the switch, and turn the power on.

6. Determine if the pattern on the screen is tilted, centered incorrectly, or geometrically distorted; then proceed to the correct adjustment section as follows:

   a) Picture tilted: Tilt adjustment
   b) Picture not centered: Ring adjustment
   c) Geometric distortion: Geometric adjustment

7. If you are not sure what adjustment is needed, or if all of them seem needed, do all three adjustments in sequence (a, b, and c).

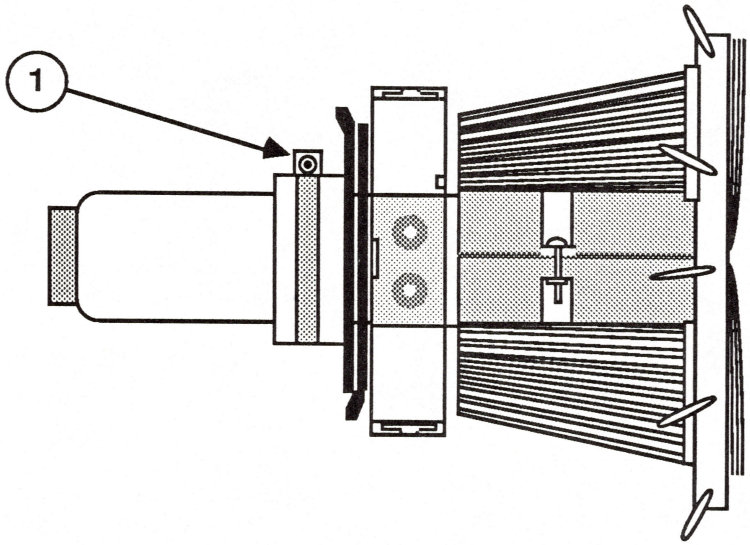

FIGURE 4

Tilt Adjustment

CAUTION: THERE ARE HIGH VOLTAGES ON THE YOKE ASSEMBLY; HANDLE ONLY THE PLASTIC PARTS OF THE YOKE. DO NOT TOUCH THE WIRES.

1. If using the Apple II Peripherals Diskette, select "Monitor Tests" from the menu; then select "Test #1" (Dot Pattern). If using the ROM card, select Video Pattern (V).

2. Locate the yoke on the stem of the CRT (see Figure 4).

3. Locate and loosen the Phillips screw that holds the C-ring on the yoke. The screw is toward the back part of the yoke (see Figure 4, #1). Do not remove the screw; just loosen it enough to make the yoke mobile.

   NOTE: If the yoke is tacked to the CRT with RTV glue, you will have to cut the glue before you can move the yoke. Power off the monitor and **DISCHARGE THE ANODE** before attempting to make these cuts. (See the discharge procedure under **Main Electronics Assembly** in the **Take-Apart** section.) When the yoke assembly is loose, power on the monitor again.

4. Turn the yoke assembly clockwise and counterclockwise and watch the whole picture tilt. Then gently move the assembly backward and forward on the stem and see how the whole raster can be made smaller or larger.

5. Push the yoke forward on the stem as far as it will go to obtain the largest raster possible. The ideal size raster would fill up most of the screen, leaving a 1/2 inch border on all four sides. You may need to do the main electronics assembly height and width adjustments to get the proper size.

6. Adjust the yoke so that the image is level with the line you drew on the screen or with the top of the screen. If it is hard to tell if it's level, press <ESC> to go back to the menu and choose "Test #2" (Grid Pattern).

7. Retighten the C-ring screw. Be careful not to overtighten, as that could cause damage to the tube stem. Just tighten it enough to be snug.

8. Tack the yoke to the CRT using some RTV glue.

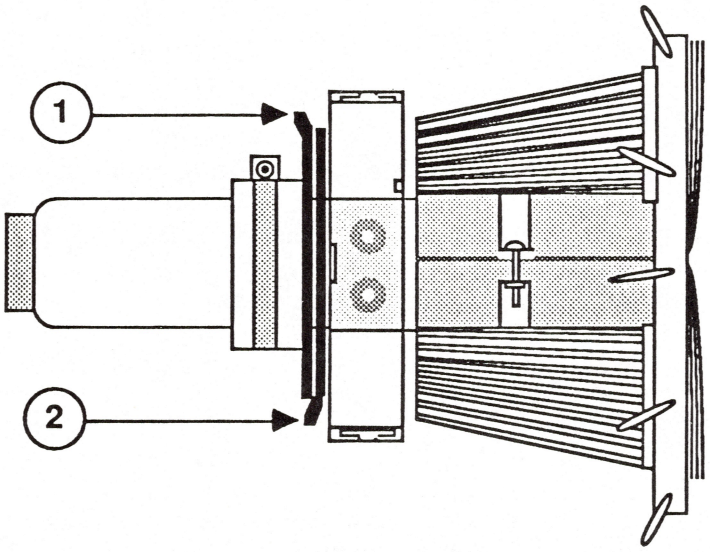

FIGURE 5

Ring Adjustment

This adjustment is made when the image is not centered. The final result should be that the center of the pattern lines up with the cross lines on the screen.

1. If using the Apple II Peripherals Diskette, select "Test #1" (Dot Pattern) from the menu. If using the ROM card, select Video Pattern (V).

2. Locate the two front and rear ring magnets on the rear part of the yoke (see Figure 5).

3. The ring that is closest to the rear of the yoke (see Figure 5, #2) is the coarse adjustment. Rotate this ring and observe the effect it has on the centering of the image. Position it so that the image is as close to center as possible.

4. Now rotate the front ring (see Figure 5, #3). This is the fine adjustment. Rotate it until the image is centered on the cross lines you put on the screen. It might be necessary to hold the rear ring steady as you move the front one.

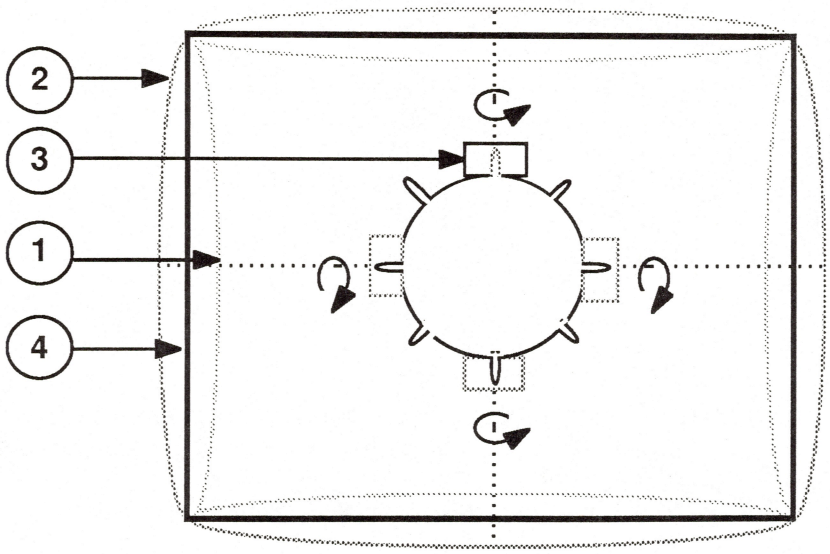

FIGURE 6

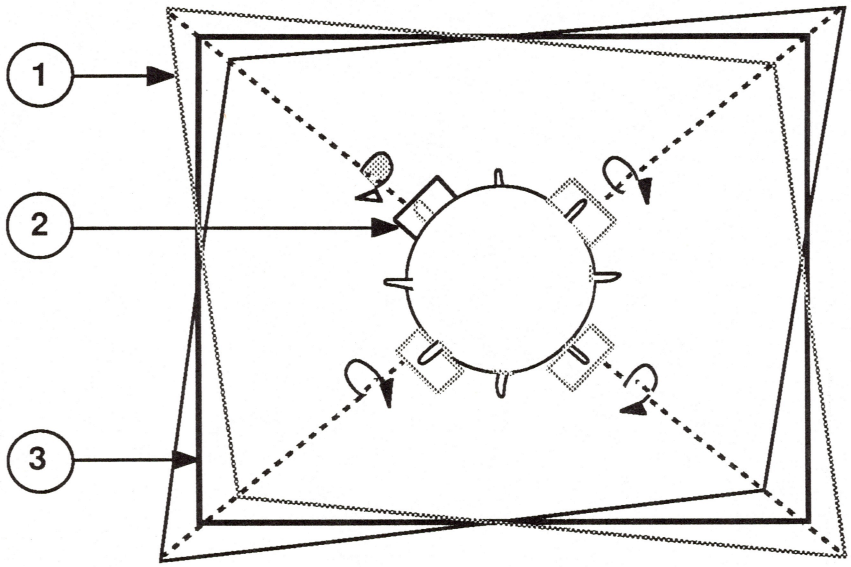

FIGURE 7

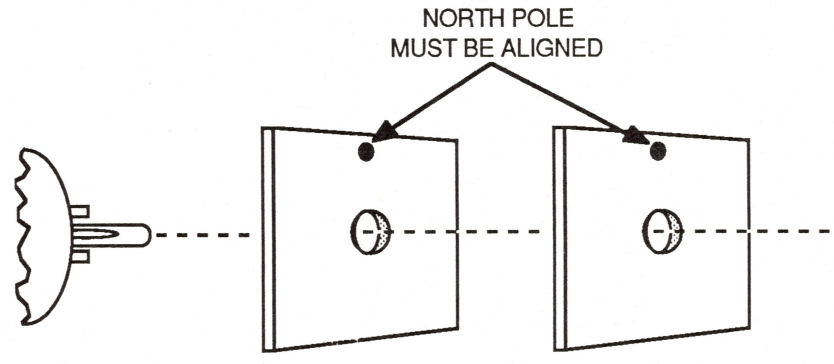

FIGURE 8

Geometric Adjustments

There are two different geometric distortions that can be seen on the screen. One is called pincushioning and barreling (see Figure 6, #1 and #2). The other is the trapezoidal effect (see Figure 7, #1). Both are adjusted for with the rotary magnets; however, each adjustment is done separately.

Pincushion/Barrel Correction

If the image shows either distortion shown in Figure 6, #1 or #2, correct it by doing the following:

1. If using the Apple II Peripherals Diskette, select "Test #1" (Dot Pattern) from the menu. If using the ROM card, select Video Pattern (V).

2. Push a magnet on the yoke mounting pin as shown in Figure 6, #3. A magnet should be placed only on the pin that corresponds to the affected area.

3. Rotate the magnet to obtain the desired raster (see Figure 6, #4).

4. If the desired raster cannot be obtained, add a second magnet to the same yoke mounting pin. Both magnets must be aligned as in Figure 8, and then rotated simultaneously.

5. Adjust all the sides with magnets until they all line up correctly.

Trapezoidal Correction

Figure 7, #1 shows the trapezoidal effect. Look at your screen and see if any of the corners exhibit the trapezoidal effect. If any do, then perform the following adjustment:

1. If you are using the Apple II Peripherals Diskette, select "Test #1" (Dot Pattern) from the menu. If using the ROM card, select Video Pattern (V).

2. Push a magnet onto the yoke mounting pin as shown in Figure 7, #2. The magnet should be placed only on the pin that corresponds to the affected area.

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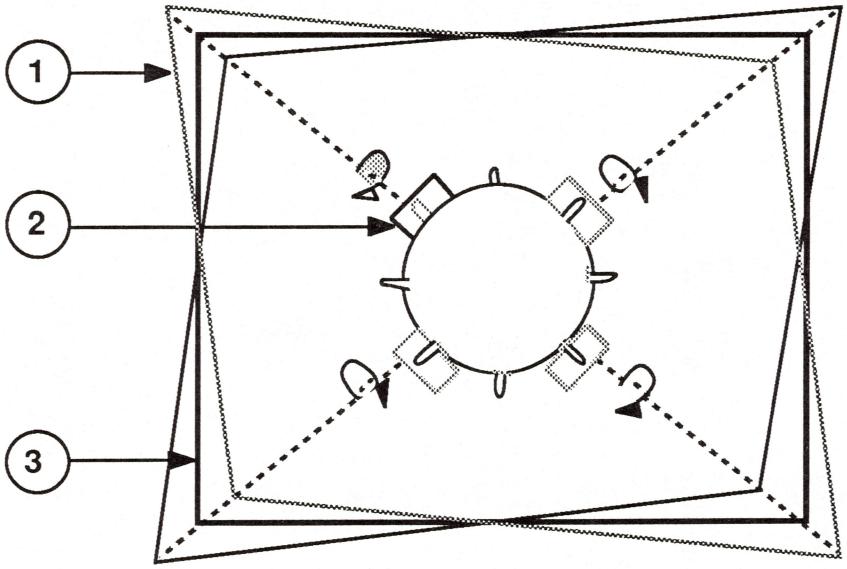

FIGURE 9

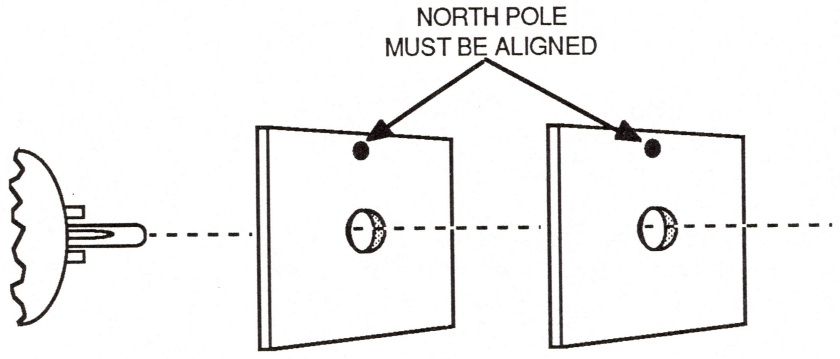

FIGURE 10

3. Rotate the magnet to obtain the desired raster, see Figure 9, #3.

4. If the desired raster cannot be obtained, add a second magnet to the same pin. Both magnets must be aligned as in Figure 10, then rotated simultaneously.

5. Do the adjustment until all the corners appear normal.

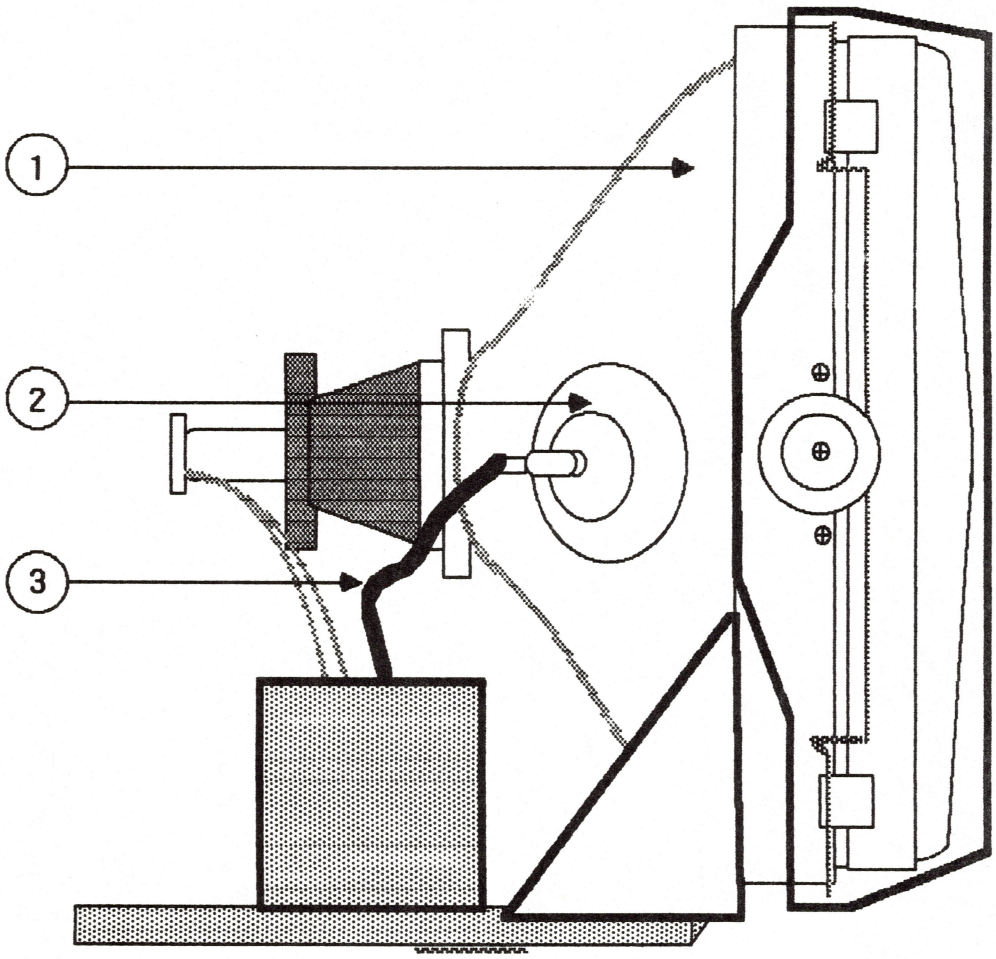

FIGURE 11

MAIN ELECTRONICS ASSEMBLY ADJUSTMENTS

After replacement of the Main Electronics Assembly on the Monitor II, the horizontal or vertical alignment may need adjustment. This procedure covers these adjustments. It is important that you read all the steps completely before beginning the adjustments, as several of them interact with each other. If it looks as if a step is not working, it is possible that another step will correct the problem.

Materials Needed

Monitor II
Apple II, II Plus, or IIe
Apple II Peripherals Diskette
  or the Apple IIe Diagnostic ROM Card
Plastic hex tip iron core adjustment tool (size 0.100)
Plastic square-tip coil adjustment tool (size 1/8" square);
  one manufacturer is Spectrol.
Small plastic flatblade screwdriver (tweaker)

CAUTION: YOU WILL BE WORKING WITH A LIVE HIGH VOLTAGE PICTURE TUBE. HIGH VOLTAGE IS PRESENT ON THE ANODE OF THE PICTURE TUBE, THE ANODE CAP, AND ANODE LEAD, (SEE FIGURE 11, #1, 2, AND 3, RESPECTIVELY). DO NOT TOUCH THE TUBE, ANODE CAP, OR ANODE LEAD: EXTREME SHOCK CAN OCCUR. DO NOT TOUCH OR HOLD ON TO THE CHASSIS WITH THE OTHER HAND -- KEEP IT BEHIND YOUR BACK OR IN YOUR POCKET WHEN MAKING THE ADJUSTMENTS.

Set-Up Procedure

1. Remove the Monitor II case (see **Section 2, Take-Apart**).

2. Connect the video cable from the monitor to the Apple II, II Plus, or IIe video output phono jack.

3. If you are using the Apple II Peripherals Diskette, do the following:

   a) Insert the diskette in the disk drive.

   b) Power up the system.

   c) Select "Test #1" (Dot Pattern) from the menu.

4. If you are using the IIe Diagnostic ROM card, do the following:

   a) Insert the ROM card into slot 1 or 2 of the IIe.

   b) Make sure the switch on the top of the card is pointing to the rear of the system.

   c) Power up the system.

   d) Select the Video Tests (V) from the menu.

   NOTE: If the menu does not appear when the power is turned on, and the disk drive continues to whirl, the switch is in the wrong position. Power off the system, change the switch, and turn the power on.

5. View the screen and evaluate the vertical and horizontal alignment and linearity. Determine which one needs correction, and proceed to the correct adjustment. Remember that there is interaction between the two adjustments and that you might have to do both to correct any problems.

When evaluating the pattern, do not use the dots or grid boxes in the corners as examples: use the middle of the rows. If the corners look incorrect even after adjustments have been made, there may be a yoke alignment problem and you should proceed to that section. Other guidelines to follow for evaluating the vertical and horizontal alignments are as follows:

Vertical:

Do the dots or grid boxes in the top and bottom rows have the same linearity?

Are the dots or grid boxes stretched out or compressed?

Is the picture rolling?

Is the image pushed more to the top or bottom?

Horizontal:

Is the linearity of the dots or grid boxes on both sides of the screen the same?

Is the width of the characters or boxes the same?

Is the picture tearing?

Is the picture rolling in a diagonal movement on the horizontal plane?

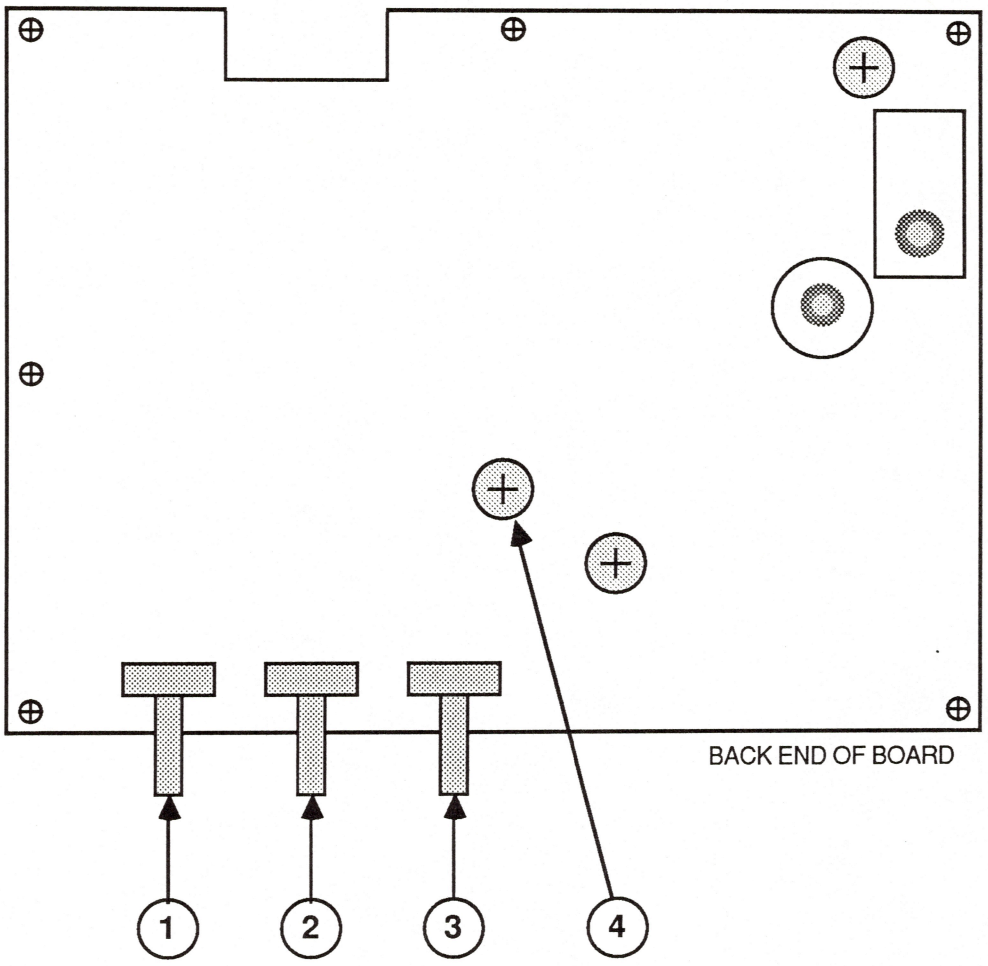

FIGURE 12

Vertical Adjustments

1. Set the vertical hold control R302 (see Figure 12, #1) near the mechanical center of its rotation. This should lock the picture on the screen and prevent any rolling.

2. **Linearity:** If the vertical linearity is off, adjust R307 (see Figure 12, #4) until the best linearity is found. Compare top and bottom characters or grid boxes and try to get them even. It's possible to reach the end of the adjustment range of the pot and find that the linearity is still not correct. That's because the height adjustment can affect the linearity. If this happens, leave the pot at the end of its range and proceed to step 3.

3. **Height:** If the vertical height of the image is incorrect, adjust R305 (see Figure 12, #2) until the desired height is obtained. A good method is as follows:

   a) Turn height control R305 counterclockwise to the end of the pot. The image will compress on the screen but still be legible.

   b) Turn the brightness control R506 (see Figure 12, #3) clockwise until you can see black edges at the top and bottom of the screen. If you don't see black edges on the top and bottom, turn the height pot R305 counterclockwise until the pattern is squeezed and the black area appears. If the pattern becomes blurred, then the brightness control is turned too far.

   c) Adjust the height control R305 so that the black edges just disappear on the top and bottom of the screen. That will make the whole screen green in color and the dots or grid boxes just about the correct height. You can go a little further if you prefer larger characters.

   d) Turn the brightness control R506 counterclockwise until the background on the screen goes black and the pattern is bright.

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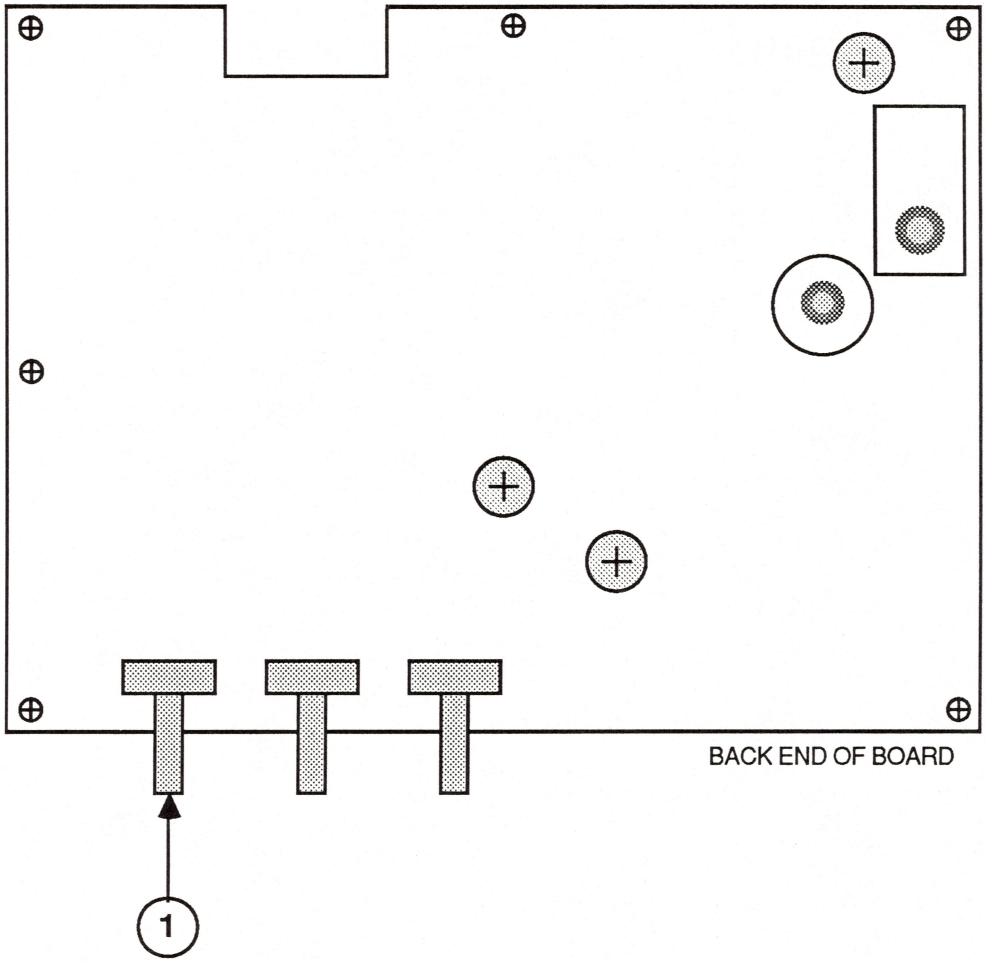


FIGURE 13

4. Re-evaluate the vertical linearity of the characters or boxes, as adjusting the height can affect the linearity. If the linearity has changed, repeat step 2 above. However, once adjusted, do not repeat steps 3 and 4 again. Proceed to step 5.

5. If necessary, readjust the vertical hold control R302 (Figure 13, #1) until the picture locks (stops rolling) on the vertical sync.

6. Turn the monitor off and on and see if the picture rolls. If it does, repeat steps 5 and 6 until it stops rolling.

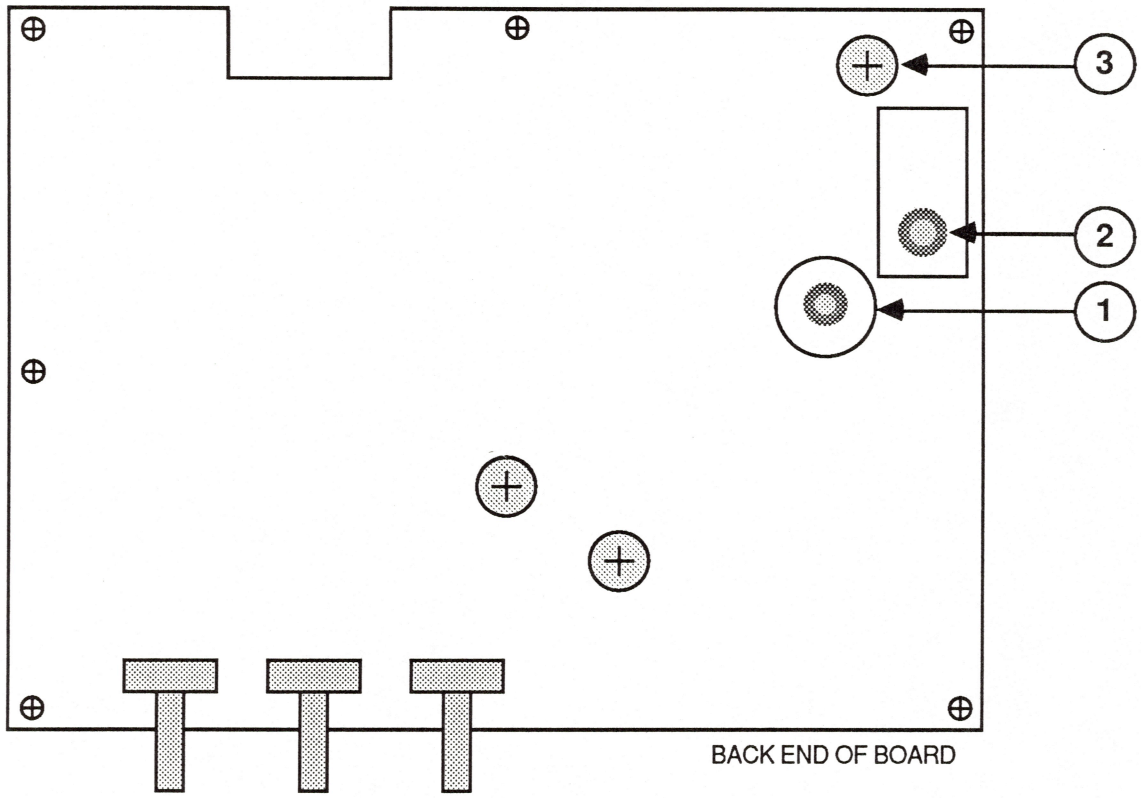


FIGURE 14

HORIZONTAL ADJUSTMENTS

1. If the picture on the tube is not locked and centered, or if it is tearing, adjust pot R406 (see Figure 14, #3). Be careful on this adjustment, as you will be physically close to the anode and anode lead in reaching the pot.

2. If the raster will not lock in after adjusting the pot R406 to both ends, it is possible there is a problem with the DC power supply.

3. Observe one row of characters or grid boxes and look for width variations on both sides of the screen. If they are all the same width throughout the row, the linearity is OK, and you can proceed to step 5. If they are not, then adjust the linearity (step 4).

4. **Linearity:** In most units, the coil L402 (see Figure 14, #2) will be preadjusted and sealed at the factory and you won't be able to change it. In this case, proceed to step 5 and see if the width adjustment will help the linearity. If you do have a unit with an adjustable coil, use the square plastic adjustment tool and turn it until the linearity looks correct. If you have adjusted the coil as far as it will go and the linearity is still wrong, proceed to the width adjustment, step 5.

5. **Width:** Check the width of the image on the screen. If it looks too narrow or too wide, then use the hex adjustment tool and adjust L401 (see Figure 14, #1) until the desired width is obtained. The image should be an equal distance (approximately 1/2 inch) from each side of the screen, and yet not squeezed together. If the linearity is wrong on one side, this adjustment might correct it. Remember that this is not a centering adjustment; don't squeeze the image just to get it centered.

6. If the unit has an adjustable linearity coil, see if the linearity has changed after step 5. If it has, touch up L402 until the linearity is correct.

7. If all the adjustments have been made and the linearity is still incorrect, suspect a problem with the components on the Main Electronics Assembly.

Monitor II Technical Procedures

Section 4

Troubleshooting

Contents:

Introduction.....4.3
No raster.....4.3
One horizontal raster line appears.....4.3
One vertical raster line appears.....4.3
Raster deformed abnormally.....4.3
Abnormal raster with winding or excessive picture fluctuation.....4.4
Spot remains with unit off.....4.4
Brightness range abnormal.....4.4
Raster size small, picture abnormally bright.....4.4
No vertical synchronization.....4.4
Raster not centered.....4.4
No picture/no contrast.....4.4
Picture/characters inclined.....4.4
Fine noises in picture, characters shiver.....4.5
15 or more seconds for picture to appear.....4.5
Picture appears/disappears.....4.5
Horizontal linearity bad.....4.5
Vertical linearity bad.....4.5
Won't focus.....4.5
Wavy display.....4.6

WARNING: Some older Monitor II's have the fuse connected to the neutral side of input power. This condition should be corrected.

Refer to the Power Cord Upgrade Procedure in **Section 0, Service Notes**, to identify and correct this condition.

INTRODUCTION

This section contains a symptom chart, showing common problems and the actions to be taken to rectify them. Find the symptom that best describes how the defective monitor appears, and then try the recommended action.

SYMPTOM	ACTION
NO RASTER	1. Check fuse on filter board, replace if blown. 2. Check that all connectors are secure on the filter board and the main electronics assembly. 3. Replace power switch. 4. Replace filter board. 5. Replace main electronics assembly. 6. Replace power transformer. 7. Replace CRT.
ONE HORIZONTAL RASTER LINE APPEARS	1. Replace main electronics assembly. 2. Replace yoke.
ONE VERTICAL RASTER LINE APPEARS	1. Replace main electronics assembly. 2. Replace yoke.
RASTER DEFORMED ABNORMALLY	1. Adjust yoke. 2. Replace yoke.

CONTINUED ON NEXT PAGE

SYMPTOM	ACTION
ABNORMAL RASTER WITH WINDING OR EXCESSIVE PICTURE FLUCTUATION	- Replace main electronics assembly.
SPOT REMAINS WITH UNIT OFF	- Replace main electronics assembly.
BRIGHTNESS RANGE ABNORMAL	1. Replace main electronics assembly. 2. Replace filter board. 3. Replace power transformer.
RASTER SIZE SMALL, PICTURE ABNORMALLY BRIGHT (HIGH VOLTAGE ABNORMALLY HIGH)	- Replace main electronics assembly.
NO VERTICAL SYNCHRONIZATION	- Replace main electronics assembly.
RASTER NOT CENTERED	- Turn yoke centering magnets. (See **Yoke Adjustment.**)
NO PICTURE, NO CONTRAST	- Replace main electronics assembly.
PICTURE/ CHARACTERS INCLINED	- Turn deflection yoke. (See **Yoke Adjustments.**)

CONTINUED ON NEXT PAGE

SYMPTOM	ACTION
FINE NOISES IN PICTURE, CHARACTERS SHIVER	- Replace main electronics. assembly.
15 OR MORE SECONDS FOR PICTURE TO APPEAR	- Change CRT.
PICTURE APPEARS, DISAPPEARS	1. Replace main electronics. assembly. 2. Replace CRT.
HORIZONTAL LINEARITY BAD	1. Check horizontal adjustment. (See **Main Electronics Assembly Adjustments.**) 2. Replace main electronics assembly.
VERTICAL LINEARITY BAD	- Check vertical adjustment. (See **Main Electronics Assembly Adjustments.**)
WON'T FOCUS	1. Replace main electronics assembly. 2. Replace CRT.

CONTINUED ON NEXT PAGE

SYMPTOM		ACTION
WAVY DISPLAY	-	Mounting screw on the heat sink is loose.*

* If a Monitor II starts to exhibit a wavy display, it may be caused by the overheating of the voltage regulator (IC 601). The regulator is mounted on the heat sink near the power transformer.

If the failure occurs after the unit has had time to heat up, it indicates that the mounting screw that secures the voltage regulator to the heat sink is loose. This results in inadequate heat transfer between the two components.

If you must replace the voltage regulator, be sure to use thermal compound or an insulator pad between the voltage regulator and the heat sink.

Monitor II Technical Procedures

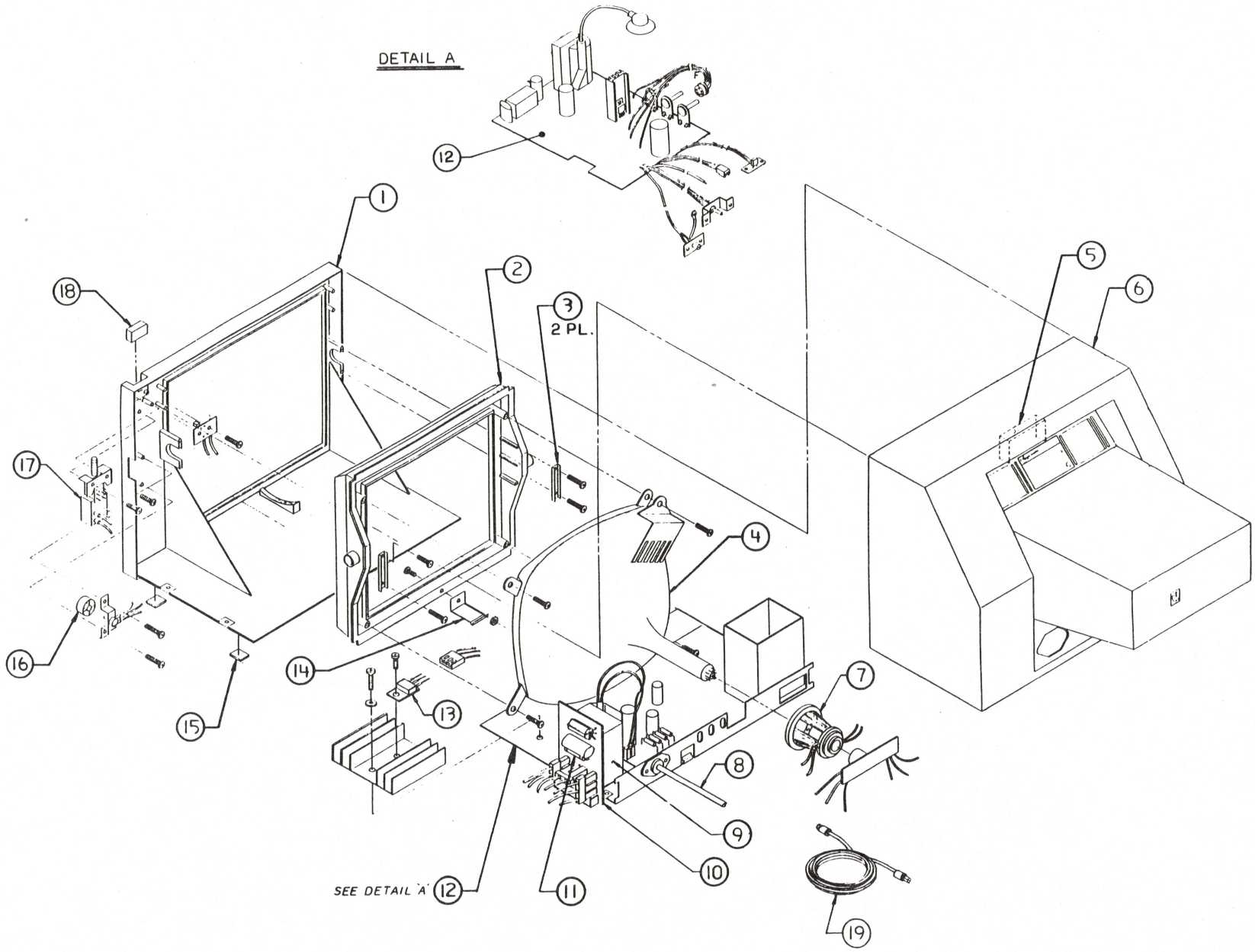
Section 5

Illustrated Parts List

The figures and lists below include all piece parts that can be purchased separately from Apple for the Monitor II, along with their part numbers. These are the only parts available from Apple. Refer to your Apple Service Programs manual for prices.

Contents:

Illustrated Parts List.....5.3


DETAIL A
12
1
2
18
3
2 PL.
5
6
17
4
16
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7
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13
8
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10
SEE DETAIL 'A'
12
11
19

MONITOR II

Item	Part No.	Description
1	815-0779	Bezel Enclosure, Beige
	815-1049	Bezel Enclosure, Platinum
2	815-0780	Mask Enclosure, Beige
	815-1050	Mask Enclosure, Platinum
3	805-0200	Plate, Pivot Retaining
4	076-0099	Monitor II CRT Module
5	815-0786	Filler, Handle Cavity
6	815-0778	Rear Housing Enclosure, Beige
	815-1048	Rear Housing Enclosure, Platinum
7	970-0453	Deflection Yoke
8	970-0629	Power Cord
9	970-0447	Power Transformer, 115V
10	699-0211	PCB, Line Filter
11	740-0106	Fuse, .5A, 250V, Quick Acting (Domestic, 110V only)
	740-0011	Fuse, .5A, 250V, Quick Acting, Pigtail (Domestic, 110V only)
	740-0200	Fuse, 1A, 250V, Slow Blow (Euro/Intl only)
	740-0070	Fuse, 1A, 250V, Slow Blow, Pigtail (Euro/Intl only)
12	661-75134	Main Electronics Assembly
13	353-7815	IC, 7815, 15V POS. Volt Reg. IC601
14	805-0202	Spring, Ratchet
15	865-0020	Foot, .81 IN SQ, .35 IN THK, Black
16	815-0781	Contrast Knob, Beige
	815-1051	Contrast Knob, Platinum
17	970-0445	Power Switch Assembly, 120V
18	815-0787	Power Switch Knob, Beige
	815-1052	Power Switch Knob, Platinum
19	590-0539	Video Cable, Smoke

AppleColor Monitor 100

APPLECOLOR MONITOR 100 TECHNICAL PROCEDURES

TABLE OF CONTENTS

Section 1 - Basics

Product Description.....1.2
Safety Precautions.....1.3
Disposing of the Cathode-Ray Tube (CRT).....1.7

Section 2 - Take-Apart

Removing the Rear Enclosure.....2.3
Replacing the Rear Enclosure.....2.3
Discharging the CRT.....2.5
Removing and Replacing Procedures:
- Logic Board.....2.7
- Power Supply (P/S) Board.....2.13
- Power Transformer.....2.14
- Tilt Motor.....2.17
- Front Bezel.....2.19
- CRT/Yoke Assembly.....2.21
- Mask.....2.25
- Brightness/Contrast Control Knobs.....2.27
- Brightness/Contrast Control.....2.27
- Green Only Switch.....2.29
- Power Button/Switch...(LED).....2.31
- Tilt Motor Button/Switch.....2.33
- Replace the Power Supply Fuse (F601).....2.35

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Section 3 - Adjustments

Logic Board Adjustments.....3.3
Introduction.....3.3
Materials Needed.....3.3
Setup Procedure.....3.5
Evaluating the Video Test.....3.7
Vertical Adjustments.....3.9
Horizontal Adjustments.....3.9
Focus Adjustment.....3.9
Color Adjustments.....3.11
Color Bar Check.....3.11
White Balance.....3.11

Section 4 - Troubleshooting Guide

Introduction.....4.2
Symptoms.....4.2

Section 5 - Illustrated Parts List

AppleColor Monitor 100 Illustrated Parts.....5.3
Monitor Cables.....5.5

AppleColor Monitor 100 Technical Procedures

Section 1

Basics

Contents:

Product Description.....1.2
Safety Precautions.....1.3
Disposing of the Cathode-Ray Tube (CRT).....1.7

PRODUCT DESCRIPTION

The AppleColor Monitor 100 is an accessory product to be used with the Apple II family of computers and the Apple ///. Its design incorporates the following features:

1. 12-inch tilting screen.
2. High-quality, 80-column display.
3. Green Only switch for systems that output white text.
4. Nonglare, high-contrast screen surface.
5. Accurate reproduction of color graphics.

There are two versions of the AppleColor Monitor 100: Rev. 0 and Rev. A. There are very slight differences between the two versions. Technical procedures are the same for both, except as noted.

Frequently used controls are located behind a protective door at the right front of the monitor. Other controls are on the back. Internationally recognized symbols, shown in Figure 1, are used to identify the controls.

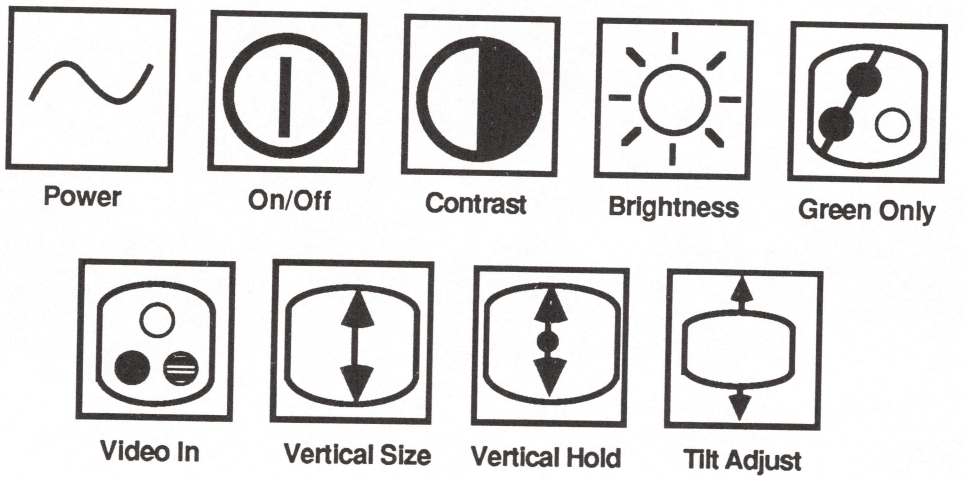

FIGURE 1

SAFETY PRECAUTIONS

The Applecolor Monitor 100 is harmless as long as you're just watching the display. Removing the cover, however, exposes you to the high-voltage Cathode-Ray Tube (CRT)--the picture tube. The following precautions must be taken to ensure your safety, especially when you are performing live adjustments on the monitor.

Safe Electrical Setup

1. **Be sure your outlet is correctly wired and properly grounded.**

   Polarity and ground testers are available from most electronics stores. Test all outlets in your service area before working on **any** electrical equipment. If you have any doubts about your building's wiring, consult a qualified electrician.

2. **Never use an adaptor plug to connect a monitor's three-prong power plug to a two-prong wall outlet.**

   Adaptors defeat the ground pin, which is a safety feature.

3. **Use an isolation transformer between the monitor and the outlet when performing live adjustments.**

   Order an isolation transformer from your electronics distributor, and make it a practice to use it whenever you are working with **any** charged monitor or other powered system under test. An isolation transformer isolates the circuitry of the system under test from the power company's circuitry, reducing the likelihood of a fatal shock should you simultaneously contact high voltage and anything else that is earth-grounded.

   Do not connect more equipment to the transformer than the wattage capacity of the transformer will bear. (It is usually best to connect only one piece of equipment at a time.) We recommend an isolation transformer with a minimum wattage capacity of 500 VA, with a grounded three-prong cord and receptacle. Two such transformers, available from many electronics stores and distributors, are listed below:

   Triad N-57M Stancor GIS 500

CRT Safety Rules

1. **Do not work on a monitor alone.**

   In case of accident, it could save your life to have someone else nearby. Apple recommends that your staff be trained in Cardio-Pulmonary Resuscitation (CPR).

2. **Remove rings, watches, bracelets, hanging necklaces, and other jewelry before performing repairs on a monitor.**

   Metal jewelry is an excellent conductor of electricity. Removing jewelry will reduce the possibility of electric shock.

3. **Never use a grounding wriststrap or heelstrap or work on a grounded workbench mat when discharging a monitor or when performing live adjustments.**

   Grounding wriststraps, heelstraps, and mats are used to protect sensitive components from the damaging effects of electrostatic discharge from your own body or clothing. Even though they contain a one-megohm resistor and are designed to conduct only small electrical charges, we recommend that they be used **only** when working on "dead" (uncharged) equipment.

4. **Wear safety goggles when working with a CRT.**

   The CRT contains a high vacuum. If cracked or broken, it can implode (collapse into itself, then explode). To protect your eyes from serious injury, always wear safety goggles when working on or near a CRT, and be careful of other people in the area.

5. **Before working inside a monitor, turn off the power and disconnect the AC power cord.**

   Certain parts of a monitor chassis are hot (electrified) when the monitor is under power. Except when you must have the power on (for example, when making live adjustments), never work on a plugged-in monitor--even if you have the power turned off.

6. **Keep one hand in your pocket or behind your back when working on a live monitor.**

   This practice reduces the risk of current passing through your heart, should you accidentally contact high voltage.

7. **Always discharge the anode before touching anything inside the monitor.**

   The anode of the CRT maintains a charge of about 24,000 volts DC (even when the power is off). Before touching any internal components you must discharge this voltage. The anode can regain some charge, even after it has been discharged. If the service procedure takes more than 30 minutes, the anode should be discharged again.

8. **Never touch the anode connector or the anode aperture.**

   Normally the anode aperture (Figure 2, #1) has a connector plugged into it (Figure 3, #2). When a CRT is replaced, the anode connector is removed, exposing the anode. The anode can maintain a charge of several thousand volts (even after the power is off).

9. **Do not pick up or handle a CRT by its neck.**

   To prevent an implosion, you should take every precaution against breaking the tube. Be especially careful with the neck, the area where the tube is the thinnest.

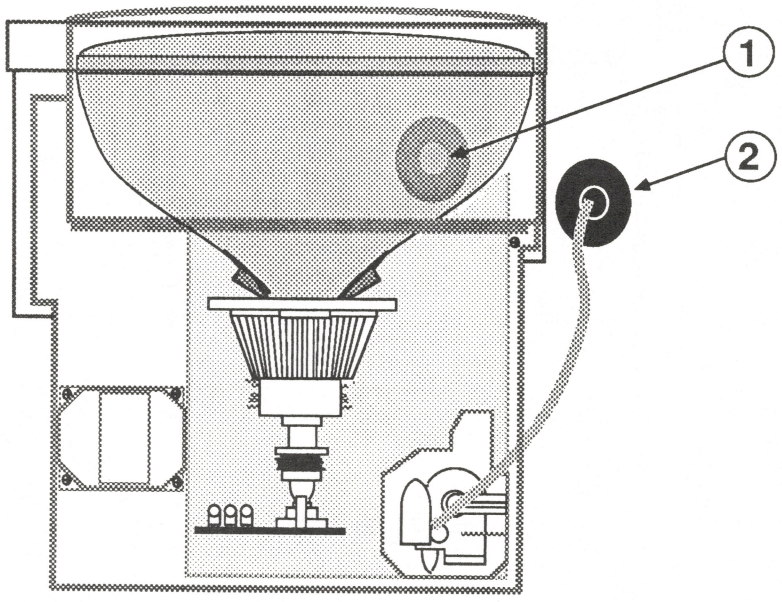

FIGURE 2

Live Adjustment Rules

In addition to the precautions listed on the previous pages, never touch the following components when adjusting a live AppleColor Monitor 100:

1. The yoke wires (Figure 3, #1)
2. The anode connector (Figure 3, #2)
3. The anode wire (Figure 3, #3)
4. The flyback transformer (Figure 3, #4)

WARNING: Serious injury could result if you touch any of these components with the power on.

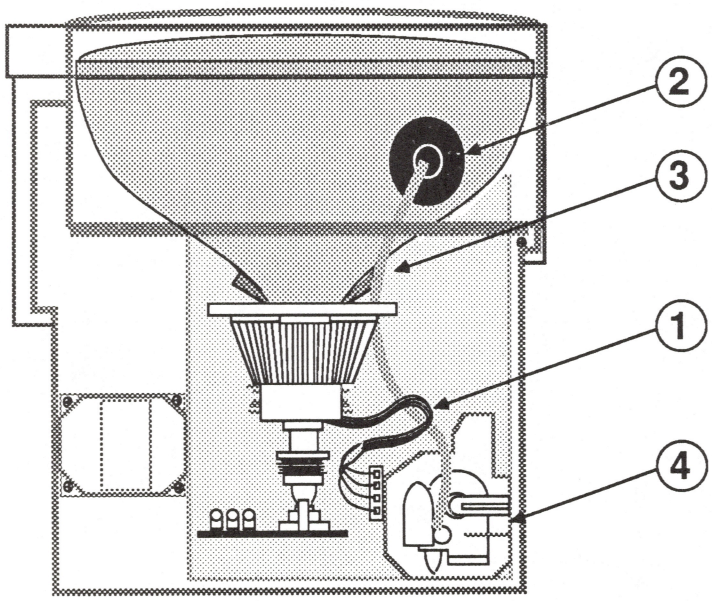

FIGURE 3

DISPOSING OF THE CATHODE-RAY TUBE (CRT)

WARNING: Remember that a CRT can implode unless it is devacuumed. Putting a defunct CRT into a trash receptacle without devacuuming it can endanger other people.

Materials Required

Thick cardboard box large enough to conceal the CRT
Large, sharp diagonal cutters
Large pliers
Duct tape
Safety goggles
Gardening gloves
12-inch square of cloth or heavy paper

Devacuuming the CRT

1. Put on the safety goggles.

2. In the side of the box about six inches from the bottom, cut or drill a hole just large enough to accommodate the very tip of the CRT.

3. Place the CRT inside the box with the tip of the neck protruding through the hole, and tape the box flaps down with duct tape (Figure 4).

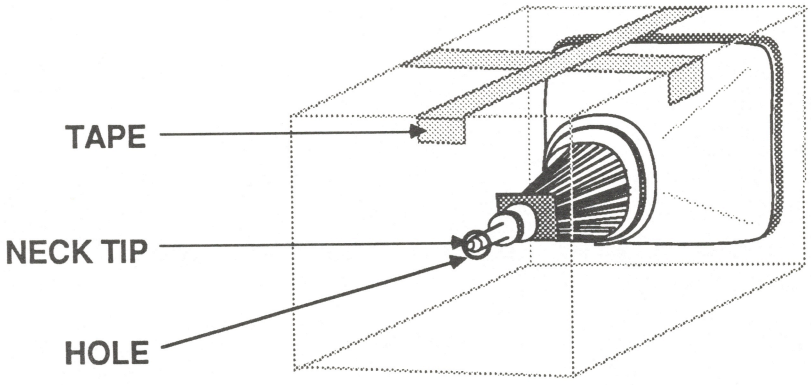

FIGURE 4

WARNING: Only the very tip of the CRT neck should be protruding through the hole in the box. The box must not have any other openings.

4. Put on the gloves.

5. Pull off the black plastic guide located at the end of the CRT neck. Using the diagonal cutters, carefully clip off the connector pins on the end of the CRT neck.

6. Tape the piece of cloth or paper onto the box (Figure 5, #1) so that it forms a veil over the opening (Figure 5, #2) but allows your hand access to the tip of the CRT. The veil's purpose is to catch the bits of glass that may fly during the following step.

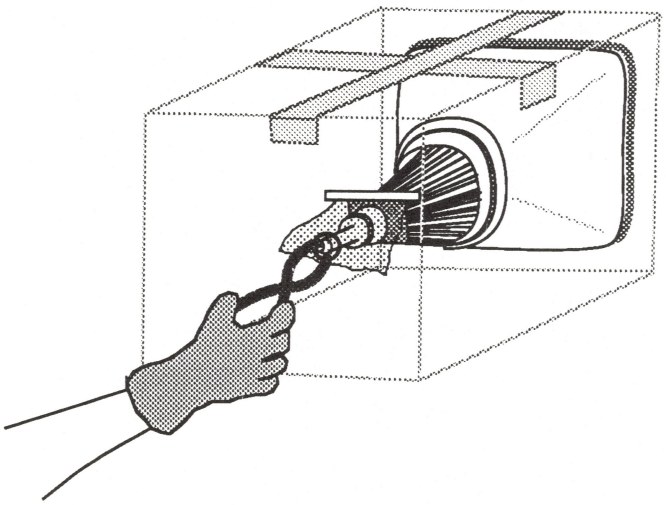

FIGURE 5

7. Make sure no one is standing nearby. Place the pliers under the veil, stand to one side, and look away while you use the pliers to snip off the exposed tip of the CRT (see Figure 5).

   WARNING: Do not look directly at the box when cutting off the tip!

   You will probably hear a rush of air entering the CRT when the CRT vacuum breaks--but even if you don't, the procedure is complete if the inner space of the CRT is clearly visible through the opening created by the removed tip.

AppleColor Monitor 100 Technical Procedures

Section 2

Take-Apart

Contents:

Removing the Rear Enclosure.....2.3
Replacing the Rear Enclosure.....2.3
Discharging the CRT.....2.5
Removing and Replacing Procedures:
- Logic Board.....2.7
- Power Supply (P/S) Board.....2.13
- Power Transformer.....2.14
- Tilt Motor.....2.17
- Front Bezel.....2.19
- CRT/Yoke Assembly.....2.21
- Mask.....2.25
- Brightness/Contrast Control Knobs.....2.27
- Brightness/Contrast Control.....2.27
- Green Only Switch.....2.29
- Power Button/Switch...(LED).....2.31
- Tilt Motor Button/Switch.....2.33
- Replacing the Power Supply Fuse (F601).....2.35
- Control Panel Door.....(See **Section 5, Illustrated Parts**)
- Tilt Loading Spring....(See **Section 5, Illustrated Parts**)

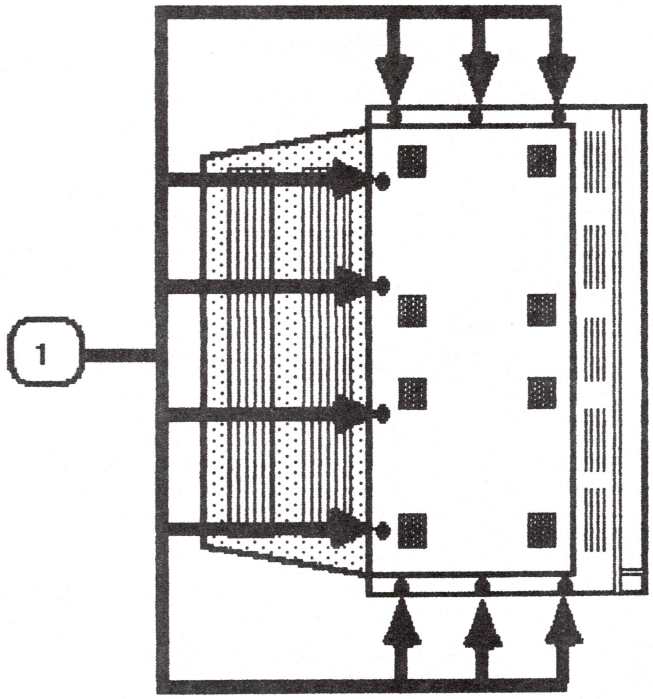

FIGURE 1

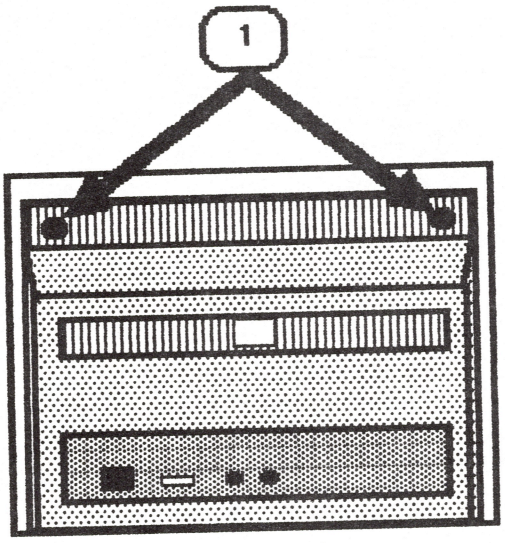

FIGURE 2

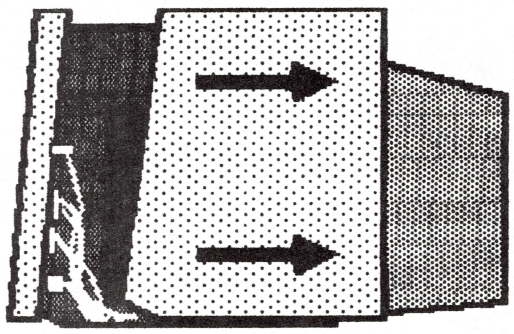

FIGURE 3

REMOVING THE REAR ENCLOSURE

1. Turn the monitor on and use the tilt switch to rotate the screen until it is facing as far down as possible. This will position the CRT neck away from the logic board for easy access to the logic board.

2. Turn the monitor off. Disconnect the AC power cord and the video cable from the back of the monitor.

3. Place the monitor on its right side and turn it so that the bottom is facing you.

4. Remove the ten screws shown in Figure 1, #1.

5. Carefully set the monitor back on its feet with the back facing you, as shown in Figure 2.

6. Remove the two screws shown in Figure 2, #1.

7. Slide the case straight back and away from the monitor (Figure 3). Set it aside.

REPLACING THE REAR ENCLOSURE

1. Turn the monitor so that the back is facing you.

2. Carefully slide the case forward onto the monitor chassis.

3. Tighten the two screws shown in Figure 2, #1.

4. Carefully set the monitor on its side with the bottom facing you and replace the ten screws shown in Figure 1, #1.

5. Set the monitor upright.

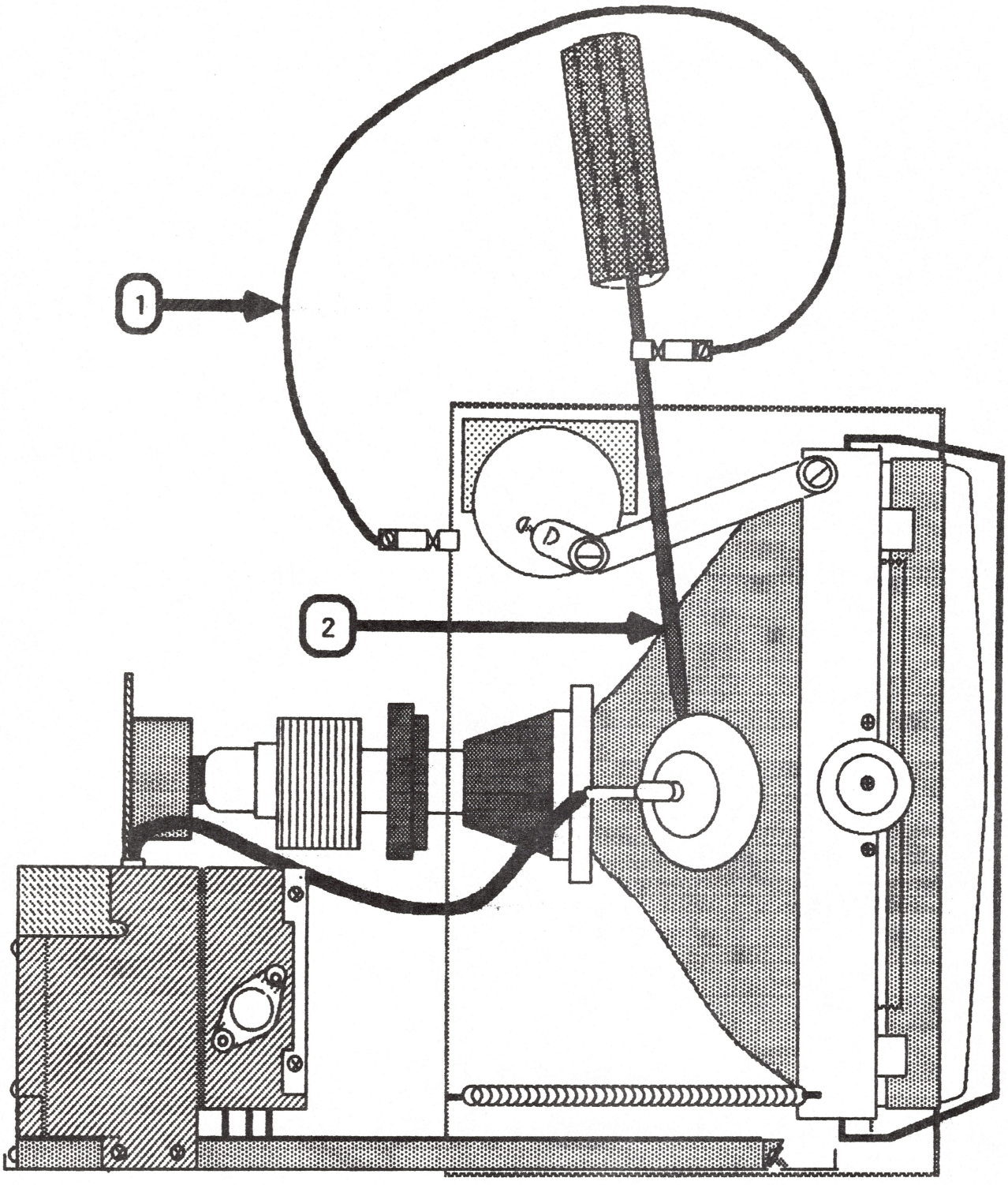

FIGURE 4

DISCHARGING THE CRT

1. Turn off the monitor.

2. Disconnect the AC power cord.

3. Remove the rear enclosure.

4. Position the monitor so that the back is facing you.

5. Remove any rings, wristwatches, bracelets, or grounding wriststraps.

6. Put on safety goggles.

7. Attach one end of an alligator lead to a long flatblade screwdriver, two inches from the insulated handle. Attach the other end to any part of the metal chassis surrounding the CRT. (Figure 4, #1).

   WARNING: USE ONLY ONE HAND WHILE DISCHARGING THE CRT. This is to eliminate any chance of your becoming a path for current should your hand slip and touch the metal part of the screwdriver. Grasp only the insulated handle of the screwdriver while discharging the CRT.

8. Slide the screwdriver under the CRT anode cap (Figure 4, #2) and push it towards the center of the cap until the blade comes into contact with the metal anode ring.

   CAUTION: DO NOT USE FORCE. If it is difficult to get the screwdriver under the anode cap, use a smaller screwdriver to loosen the suction of the anode cap on the tube. Then proceed to discharge the anode with the larger screwdriver.

9. Remove the screwdriver.

10. Remove the alligator clips.

11. Peel back the anode cap until you can see the anode ring at the center. Look at the metal connector in the center of the cap and notice how it is clipped into the CRT. Push on the cap in one direction and lift the cap off the tube.

NOTE: A secondary charge can build up even after you have discharged the CRT. To ensure that any residual charge is dissipated during the service procedure, establish a ground lead by fastening one alligator clip to the metal chassis and the other clip to the edge of the anode aperture.

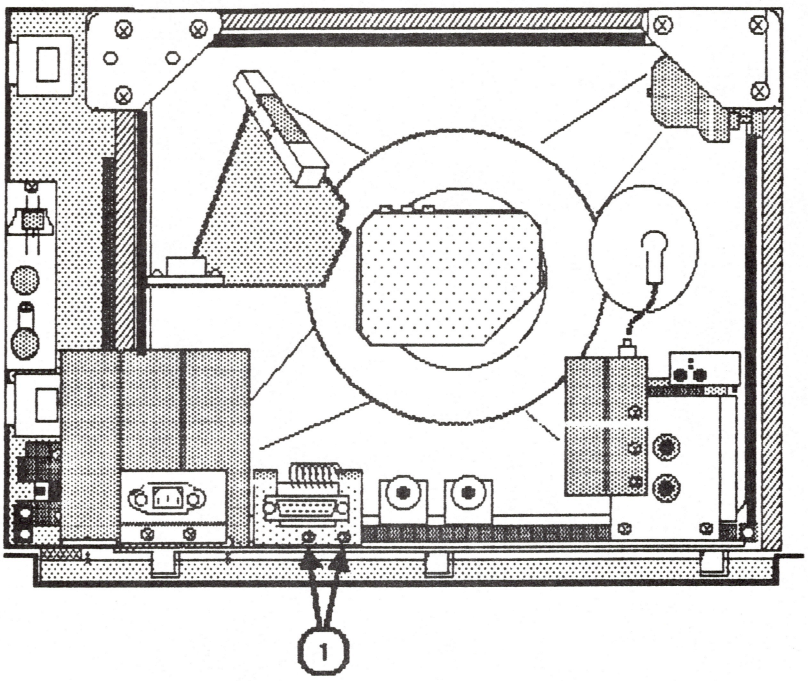

FIGURE 5

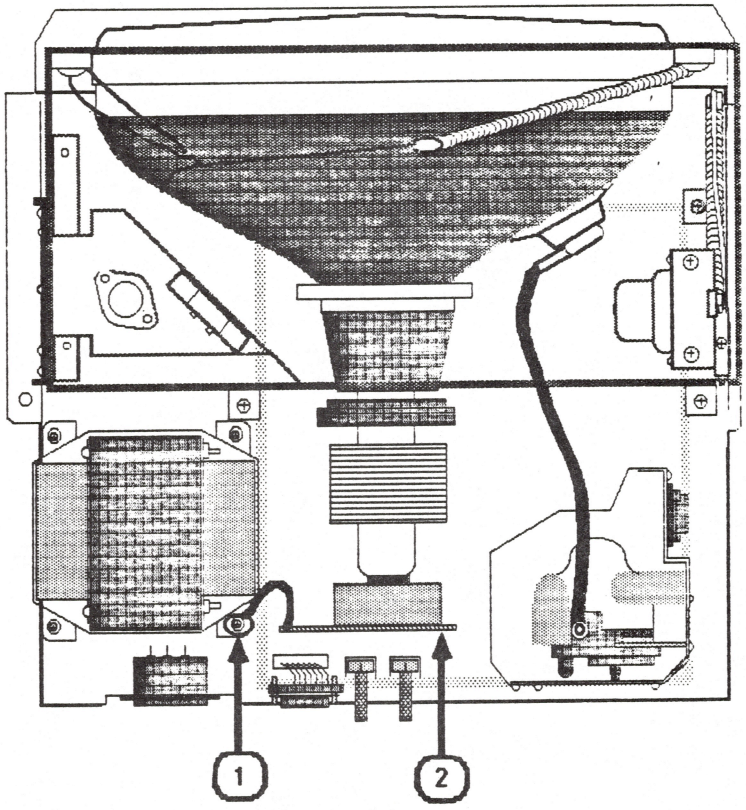

FIGURE 6

REMOVING AND REPLACING ... PROCEDURES:

Removing the Logic Board

NOTE: The CRT socket board, flyback transformer, and main logic board are all considered parts of one module since they cannot be separated from each other without desoldering components.

1. Disconnect the AC power cord.

2. Remove the rear enclosure.

3. Discharge the CRT. (See "Discharging the CRT" in this section.)

4. Remove the two Phillips screws (Figure 5, #1) which secure the metal bracket of the DB-15 connector to the chassis.

5. **DISCONNECT THE OTHER END OF THE DB-15 CABLE FROM THE LOGIC BOARD. DO NOT RETURN THIS CABLE AND ITS METAL BRACKET WITH THE DEFECTIVE LOGIC BOARD.** Keep the cable and bracket to install on the replacement logic board module. (You can order a new DB-15 cable, but you cannot order a bracket.)

6. Disconnect the ground strap by removing the power transformer screw shown in Figure 6, #1.

7. Carefully pull the CRT socket board (Figure 6, #2) away from the CRT neck until it barely clears the neck base. Hold the board so that it does not fall free, and tilt it so that the component side is facing up.

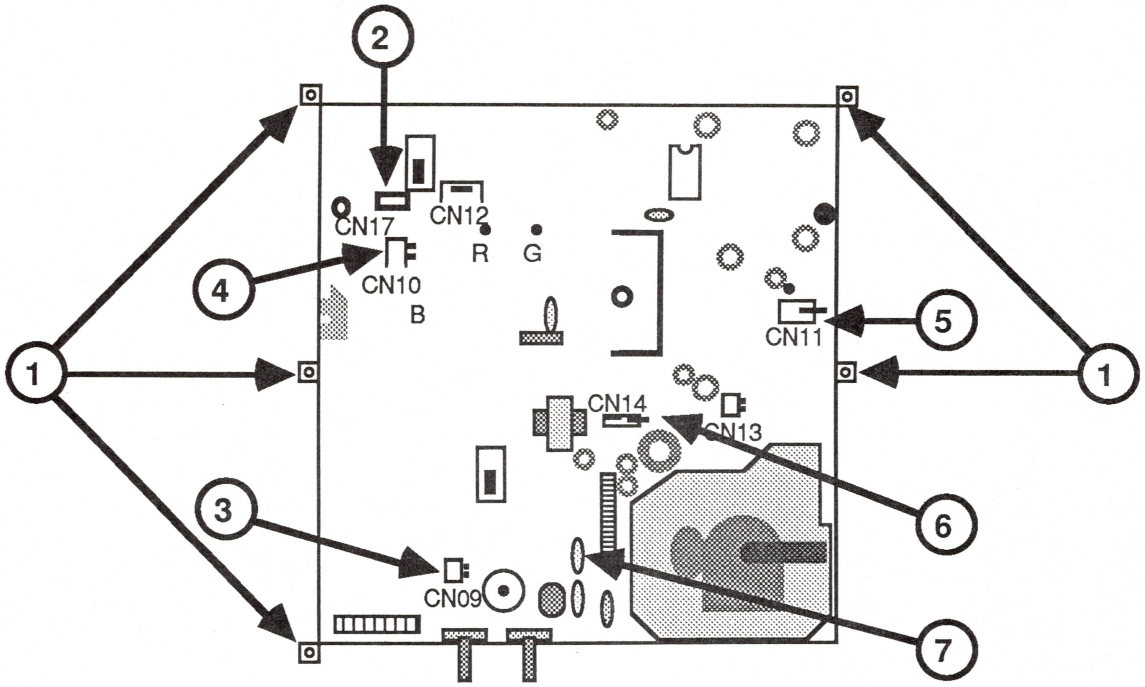

FIGURE 8

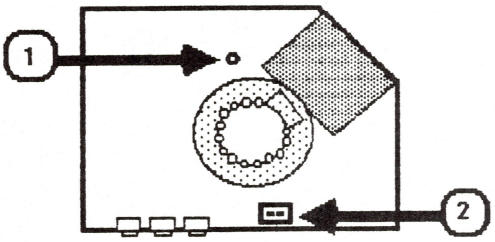

FIGURE 7

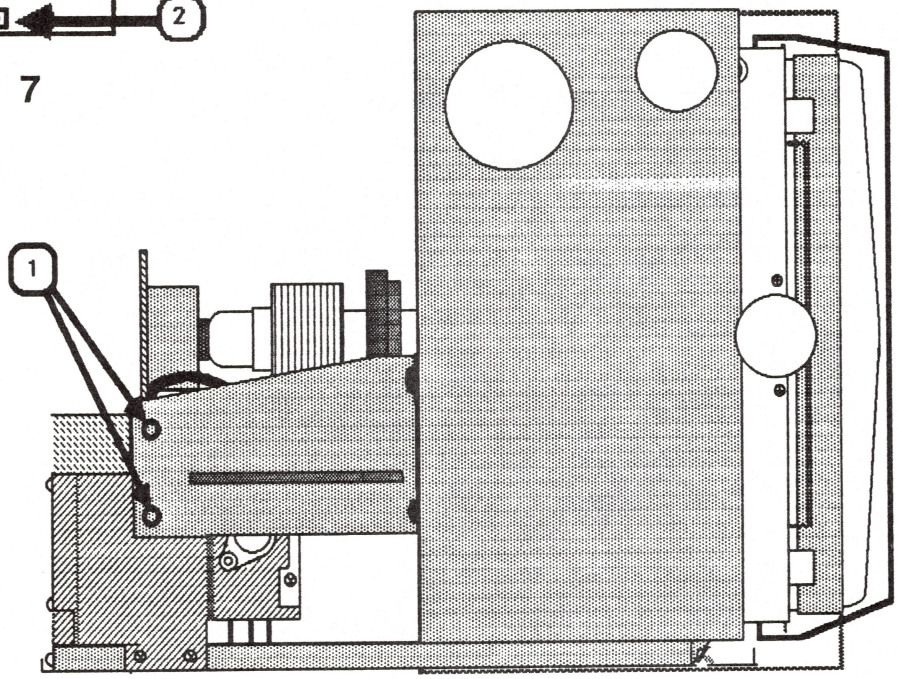

FIGURE 8A

8. Disconnect the following connectors from the CRT socket board (Figure 7):

   CAUTION: DO NOT PULL ON THE WIRES ATTACHED TO THE CONNECTORS WHEN REMOVING THEM. For those connectors with tabs, push in on the tabs before pulling the connector off.

   a) CN16 (black) -- Figure 7, #1

   b) CN17 (blue and white) -- Figure 7, #2 (AppleColor Monitor 100 Rev. 0 only)

   NOTE: On the AppleColor Monitor 100 Rev. A, CN17 is located on the logic board (Figure 8, #2) instead of on the CRT socket board.

9. Remove the five Phillips mounting screws (Figure 8, #1) from the metal plate which supports the logic board. For CRT Rev. A, also remove the two Phillips screws (Figure 8A, #1) securing the support bracket to the side of the flyback transformer.

10. Very carefully slide the logic board about halfway out of the chassis.

11. Disconnect the following connectors from the logic board:

    NOTE: If CN15 is difficult to remove, use a small flatblade screwdriver to pry at both sides of the connector to loosen it before pulling it off.

    a) CN09 (pink and green) -- Figure 8, #3

    b) CN10 (blue and black) -- Figure 8, #4

    c) CN11 (red and yellow) -- Figure 8, #5

    d) CN14 (red and black) -- Figure 8, #6

    e) CN15 (red, blue, green, yellow) -- Figure 8, #7

    f) CN17 (blue and white) -- Figure 8, #2 (Rev. A only -- see note following step 8).

12. Cut any plastic cable ties that hold wires together.

13. Carefully slide the logic board and the CRT socket board all the way out of the monitor chassis.

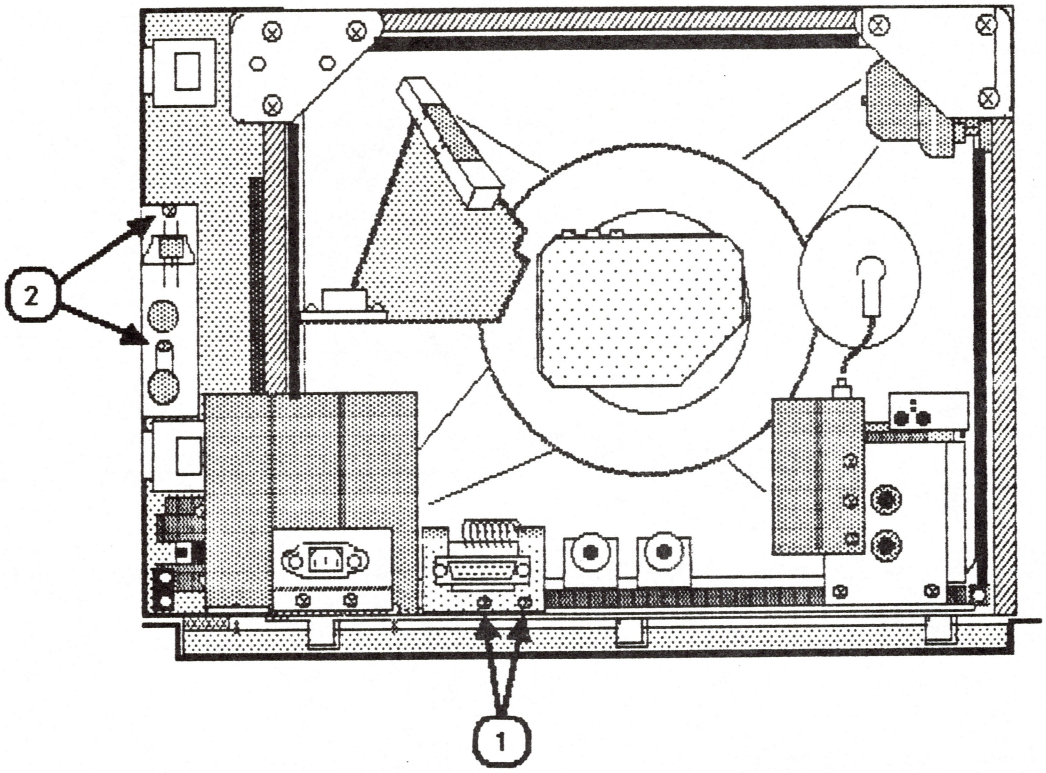

FIGURE 9

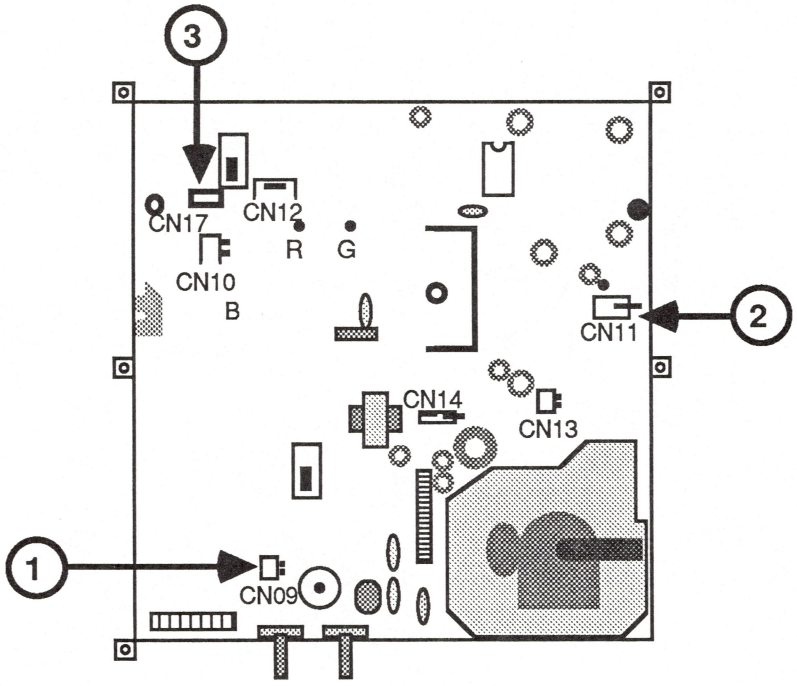

FIGURE 9a

Replacing the Logic Board

NOTE: If AND ONLY IF you are replacing the logic board of a Rev. 0 monitor with an adapted Rev. A board (identified in the packaging as a substitute assembly) follow the two steps below before continuing with the usual replacement procedure:

* Remove the two small nuts that hold the sheet metal piece to the old DB15 connector assembly (from the defective logic board). Bolt the new DB15 connector (included in the substitute service module) to the sheet metal piece.

* Remove and discard the old contrast control assembly by removing the two mounting screws (Figure 9, #2).

---

1. Slide the logic board halfway back into the chassis.

2. Connect to the logic board the connectors listed in step 11 of "Removing the Logic Board". **CAUTION: Be sure all the connector wires are placed under the CRT neck!**

3. Replace the CRT socket board. It fits only one way.

4. Position the ground strap over the power transformer screw hole and tighten the screw. (See Figure 6, #1.)

5. Replace the five Phillips mounting screws to secure the logic board to the chassis. For Rev. A monitors, also replace the two Phillips screws which secure the flyback transformer unit bracket to the chassis.

6. Connect the CRT socket board connectors listed in step 8 of "Removing the Logic Board". **CAUTION: Be sure the anode lead is not touching any other components or wires. This is to protect other components should the anode lead insulation wear off.**

7. Replace the anode cap. Replace the rear enclosure.†

† **NOTE:** If you removed the old DB15 connector and contrast control from a Rev. 0 monitor (note above), you must follow the replacement procedures below before closing the monitor:

* Replace the two screws that attach the DB15 connector's sheet metal piece to the logic board sheet metal frame (Figure 9, #1). Connect CN08 to the logic board.

* Attach the new contrast control assembly: connect CN09, CN11, and CN17 (Figure 9A) to the logic board and screw the new contrast control assembly in place (Figure 9, #2).

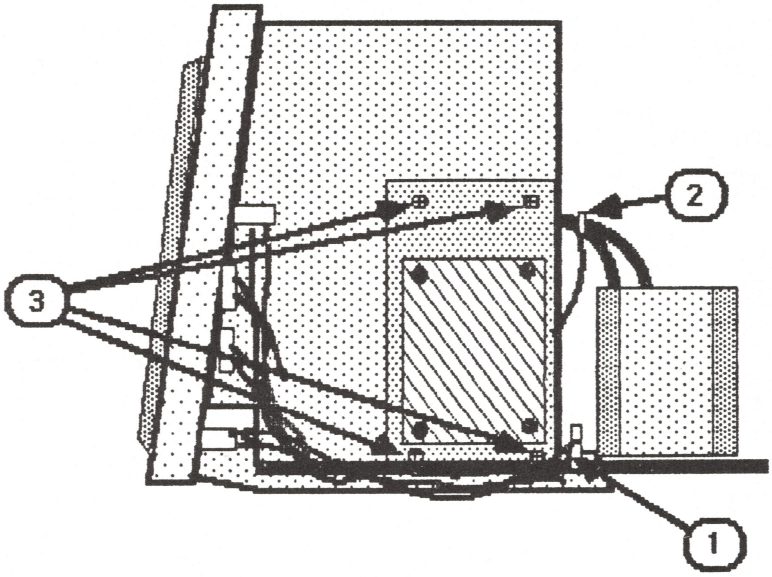

FIGURE 10

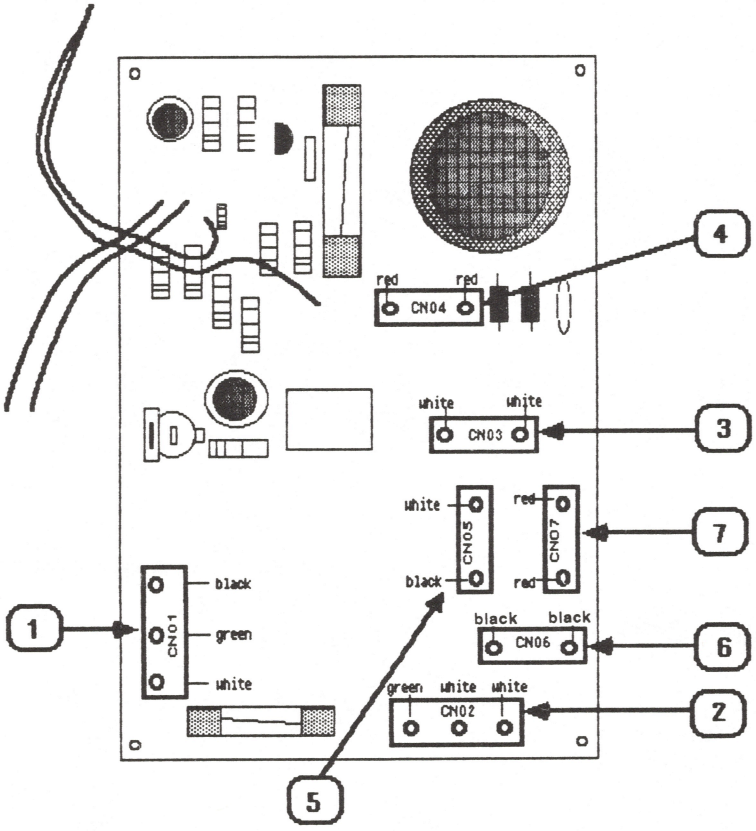

FIGURE 11

Removing the Power Supply (P/S) Board

1. Disconnect the AC power cord.

2. Remove the rear enclosure.

3. Follow steps 4 through 8 of "Discharging the CRT."

4. Disconnect CN14 from the logic board. (Figure 8, #6.)

5. Release the wires from the plastic cable clamp. (Figure 10, #1.)

6. Use a pair of diagonal cutters to cut the cable tie (Figure 10, #2) that holds the power supply wires together.

7. Remove the four Phillips screws from the P/S mounting plate (Figure 10, #3).

8. Tilt the plate slightly forward so that you can see where the connectors are on the component side (inside) of the P/S board (Figure 11).

   NOTE: The connectors are labeled on the solder side of the P/S board.

9. Disconnect the following connectors from the P/S board:

   CAUTION: Do not pull on the wires attached to the connectors when removing them. If any connectors are too hard to remove by hand, pry at the bottom of the connectors with a small screwdriver to loosen them before removing them. BUT BE CAREFUL: JIGGLING THE CONNECTORS TOO HARD WHEN REMOVING THEM MAY BREAK THE TRACES NEAR THE CONNECTOR POLES ON THE SOLDER SIDE OF THE BOARD.

   a) CN01 (black, green, and white) -- Figure 11, #1)

   b) CN02 (green, white, and white) -- Figure 11, #2)

   c) CN03 (white and white) -- Figure 11, #3)

   d) CN04 (red and red) -- Figure 11, #4)

   e) CN07 (red and red) -- Figure 11, #7)

   f) CN05 (white and black) -- Figure 11, #5)

   g) CN06 (black and black) -- Figure 11, #6)

10. Carefully remove the P/S board mounting plate.

Replacing the Power Supply (P/S) Board

NOTE: If you are installing a new power supply board, loosen the screw that mounts the white, rectangular heat sink resistor to the inside of the metal plate (see Diagram A, below). Position the resistor as shown in Diagram B, below and tighten the screw. The power supply board is now ready to be installed.

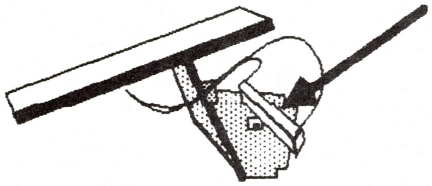

DIAGRAM A

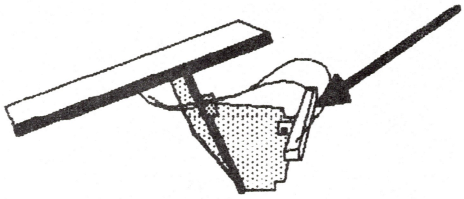

DIAGRAM B

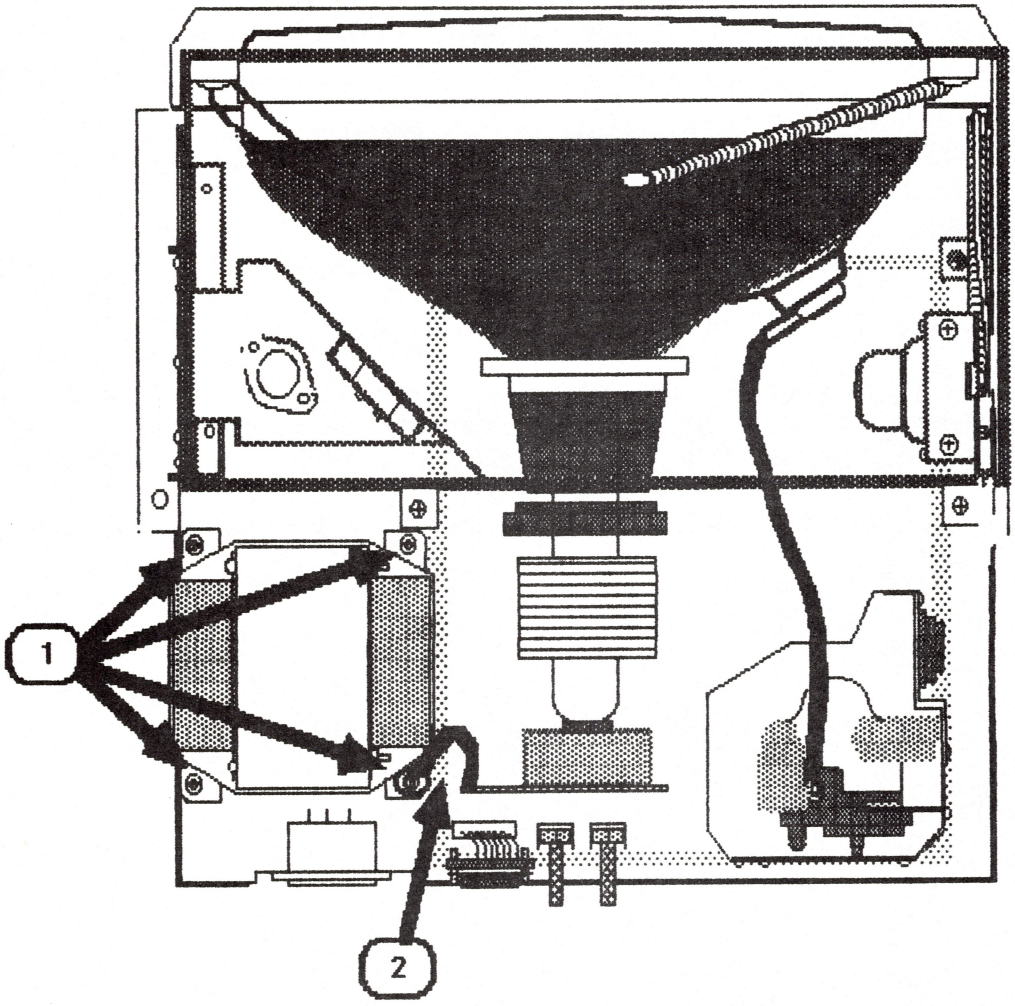

FIGURE 12

Replacing the Power Supply (P/S) Board (cont.)

1. Connect CN01 through CN07. **MAKE SURE THAT WIRE COLORS MATCH THE COLORS LISTED NEXT TO THE CONNECTORS AS SHOWN IN FIGURE 11** (see Figure 11, #1 - #7).

2. Connect CN14 to the logic board.

3. Replace the four P/S board mounting plate screws.

4. Set the wires back in the cable clamp from which they were removed (Figure 10, #1).

5. Replace the rear enclosure.

Removing the Power Transformer

1. Disconnect the AC power cord.

2. Remove the rear enclosure.

3. Follow steps 4 through 8 of **"Discharging the CRT."**

4. Remove the four power transformer mounting screws shown in Figure 12, #1.

5. Move the power transformer over so that you can easily reach the component side of the P/S board.

6. Disconnect CN04 and CN05 (Figure 11) from the component side of the power supply board.

7. Remove the power transformer.

Replacing the Power Transformer

1. Connect the CN04 and CN05 to the power supply board.

2. Place the transformer over its mounting holes with the wires closest to the P/S board. (Figure 12, #1.)

3. Position the ground strap over the proper screw hole (Figure 12, #2) and secure the ground strap by tightening the screw over the strap.

4. Replace the other three screws to secure the power transformer to the monitor chassis.

5. Replace the rear enclosure.

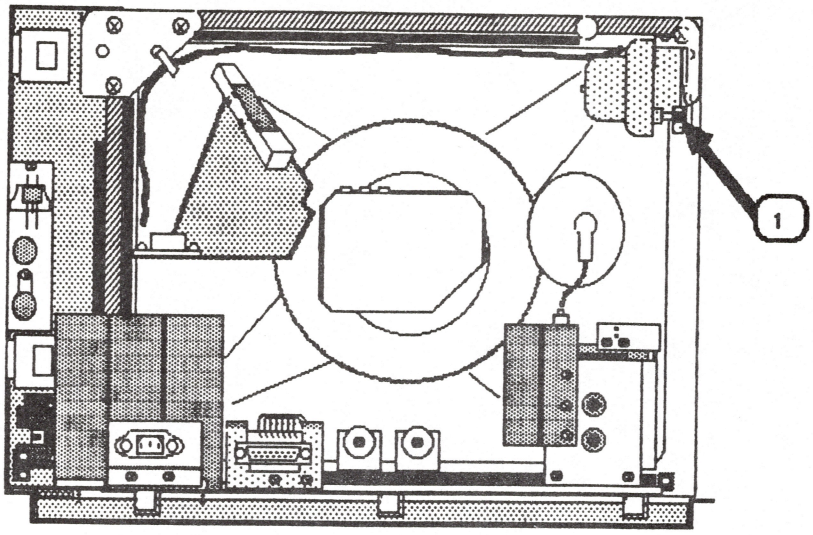

FIGURE 13

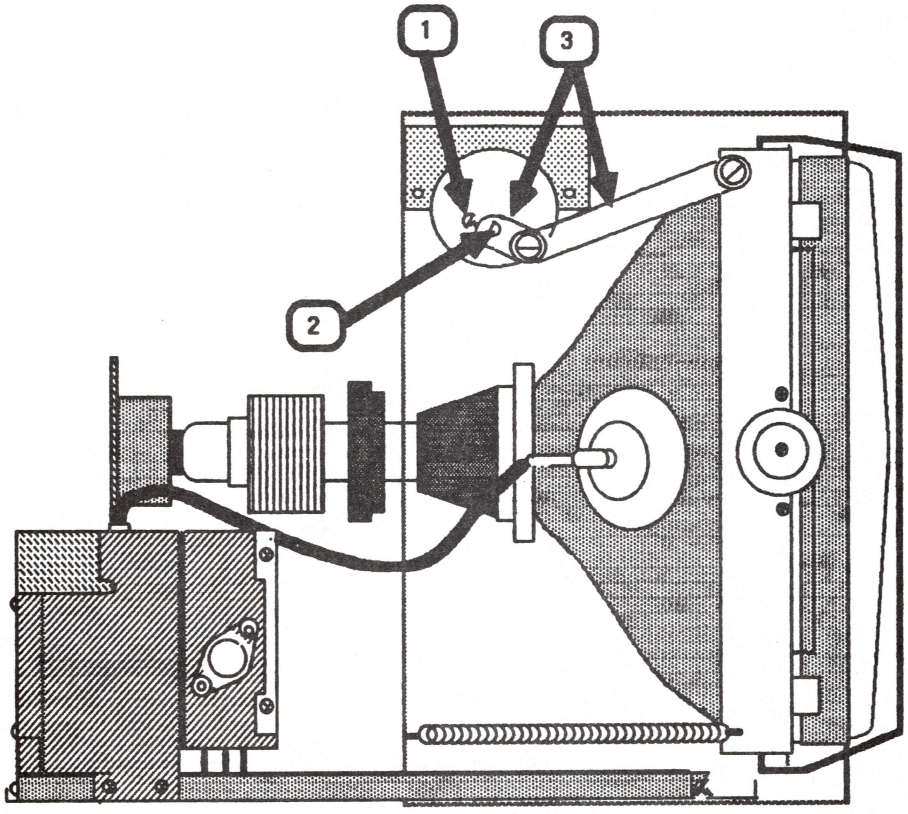

FIGURE 14

Removing the Tilt Motor

1. Remove the AC power cord.

2. Remove the rear enclosure.

3. Follow steps 4 through 8 of **"Discharging the CRT."**

4. Loosen the motor shaft screw (Figures 13, #1 and 14, #1) until the screw clears the shaft (Figure 14, #2).

5. Follow the two leads from the tilt motor to the power supply board. Cut any cable ties confining the motor wires. These wires are connected to the power supply board by connector 06 (CN06).

6. Disconnect CN06 from the power supply board.

   NOTE: If CN06 is too difficult to remove, follow steps 4 through 8 of **"Removing the Power Supply Board."** Then perform step 6, above.

7. Use a Phillips stubby screwdriver to remove the two motor bracket screws located on either side of the motor.

8. Slide the motor away from the motor bracket until the shaft clears the motor link assembly (Figure 14, #3).

9. Set the motor aside.

Replacing the Tilt Motor

1. Slide the motor shaft into its fit-through in the motor link assembly (Figure 14, #2).

2. Line up the screw holes on either side of the motor with the motor bracket holes and replace the two Phillips screws.

3. Connect CN06 on the power supply board. Replace the power supply board if you had to remove it to disconnect CN06.

4. Replace the rear enclosure.

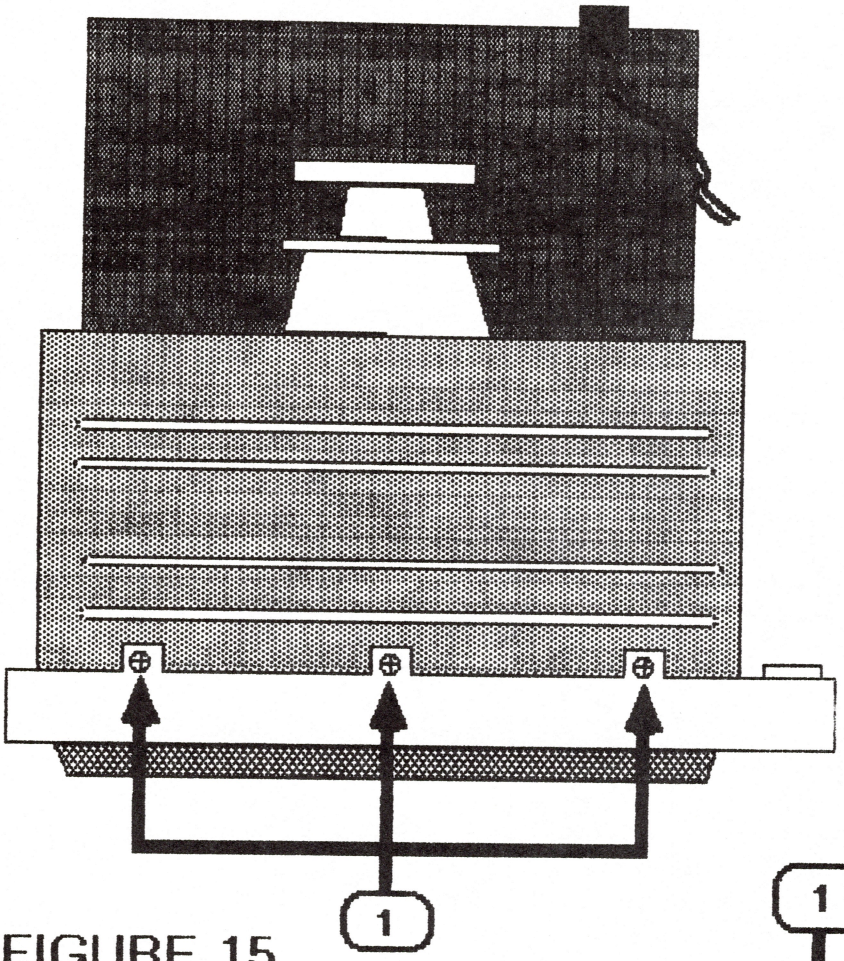

FIGURE 15

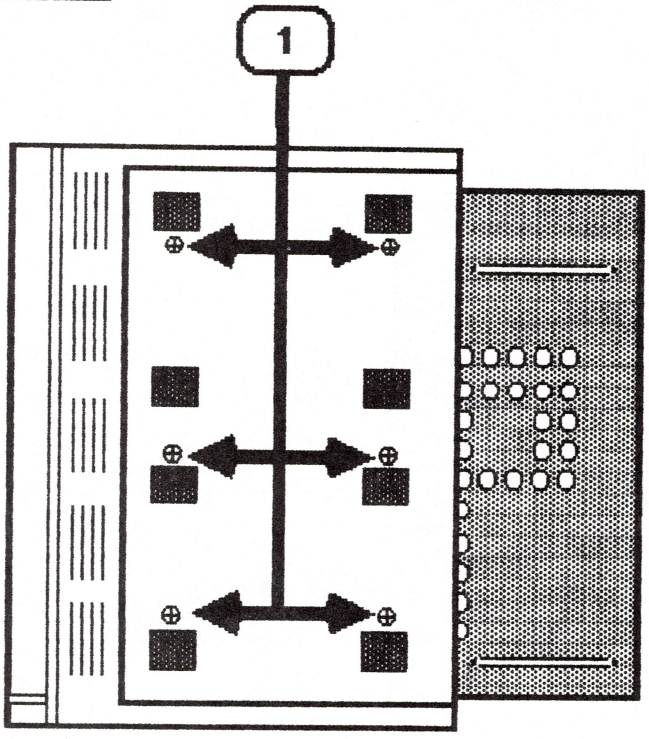

FIGURE 16

Removing the Front Bezel

1. Disconnect the AC power cord.
2. Remove the brightness/contrast control knobs.
3. Remove the rear enclosure.
4. Follow steps 4 through 8 of **"Discharging the CRT."**
5. Remove the brightness/contrast controls.
6. Remove the power button/switch.
7. Set the monitor on its feet. Figure 15 shows a top view of the monitor. Remove the three screws shown in Figure 15, #1.
8. Carefully place the monitor on its left side and remove the six screws shown in Figure 16, #1.
9. Place the monitor back on its feet.
10. Brace the front panel with one hand. Grasp the metal chassis by the top and lift it slightly off the table while you pull the front panel forward and away from the chassis.

Replacing the Front Bezel

1. Slide the front bezel back onto the metal chassis and replace the three screws at the top.
2. Mount the metal plate (brightness/contrast controls) back onto the front bezel.
3. Mount the plastic plate (On/Off - tilt) back onto the front bezel.
4. Place the monitor on its left side and replace the six mounting screws.
5. Replace the rear enclosure.

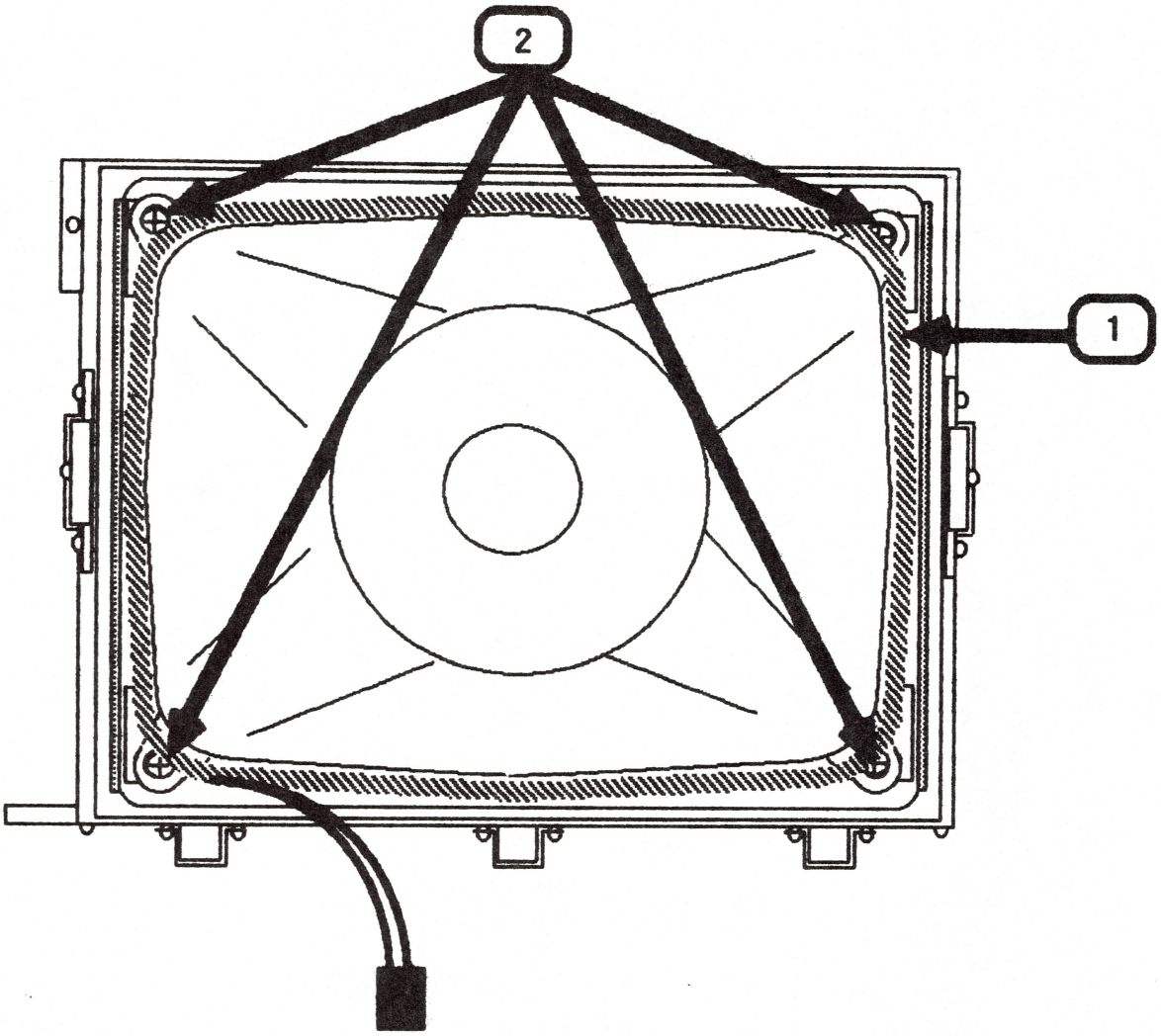

FIGURE 17

Removing the CRT/Yoke Assembly

1. Turn off the power and disconnect the AC power cord.
2. Remove the rear enclosure.
3. **Discharge the CRT.**
4. Place the monitor on a grounded workbench mat and put on your grounding wriststrap. (Never do this until after the monitor has been discharged.)
5. Remove the logic board.
6. Remove the power transformer.
7. Remove the power supply board.
8. Remove the tilt motor.
9. Remove the tilt loading spring.
10. Place the monitor face down on the grounded workbench mat.
11. Locate the degaussing coil (Figure 17, #1). It is braced to the CRT by plastic-coated holding tabs at each corner.

    NOTE: For clarity, Figure 17 shows the CRT and degaussing coil without the surrounding chassis frame, which is still in place in this step.
12. Using needlenose pliers, bend the plastic tabs out to free the degaussing coil.
13. Carefully lift out the degaussing coil and set it aside.
14. Use a long Phillips screwdriver or a 5/16 nut driver to remove the four CRT mounting screws (Figure 17, #2). Remove the large washers.
15. Supporting the CRT with one hand, set the monitor chassis upright and slide the CRT out of the chassis.
16. Place the CRT face down on a soft surface.

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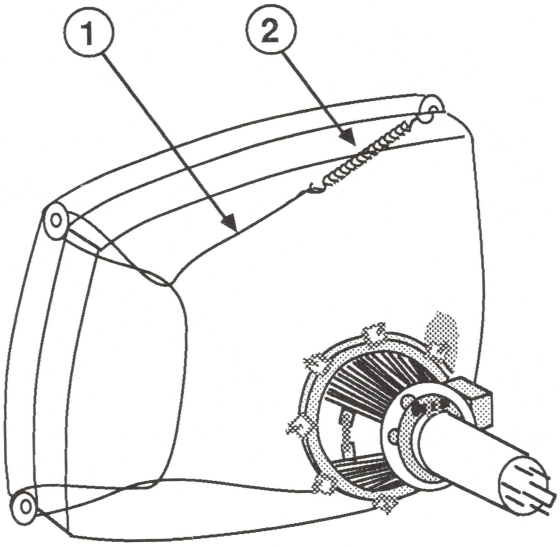

FIGURE 17A

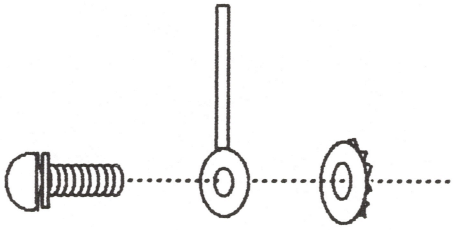

FIGURE 17B

17. Observe how the silver ground wire (Figure 17A, #1) is connected to the four corner mounting tabs of the CRT. Disconnect the spring (Figure 17A, #2) that secures the ground wire to the fourth corner mounting tab, and remove the ground wire from CRT. Save the ground wire and spring to install on the replacement CRT.

WARNING: If you intend to dispose of the CRT, refer to "Disposing of the Cathode-Ray Tube (CRT)" in **Section 1, Basics.**

Replacing the CRT/Yoke Assembly

1. Place the new CRT face down on a soft surface.
2. Loop the silver ground wire around the three corner mounting tabs and reconnect the spring to the fourth corner tab, as shown in Figure 17A.
3. Place the monitor chassis face down on the grounded workbench mat.
4. Carefully set the CRT inside the chassis with the anode on the right side as you face the rear of the CRT.
5. Place the plastic holding tabs on the CRT mounting screws. Place the large washers under the plastic tabs (see Figure 17B).
6. Hold the plastic tabs in place as you tighten the CRT mounting screws.
7. Orient the degaussing coil around the CRT so that the connector is at the bottom. Make sure the coil is as close to the front of the CRT as possible.
8. Bend the plastic holding tab stems around the corners of the degaussing coil to secure the coil to the CRT.
9. Replace the tilt loading spring.
10. Replace the power supply board.
11. Replace the tilt motor.
12. Replace the logic board.
13. Replace the power transformer.
14. Replace the rear enclosure.

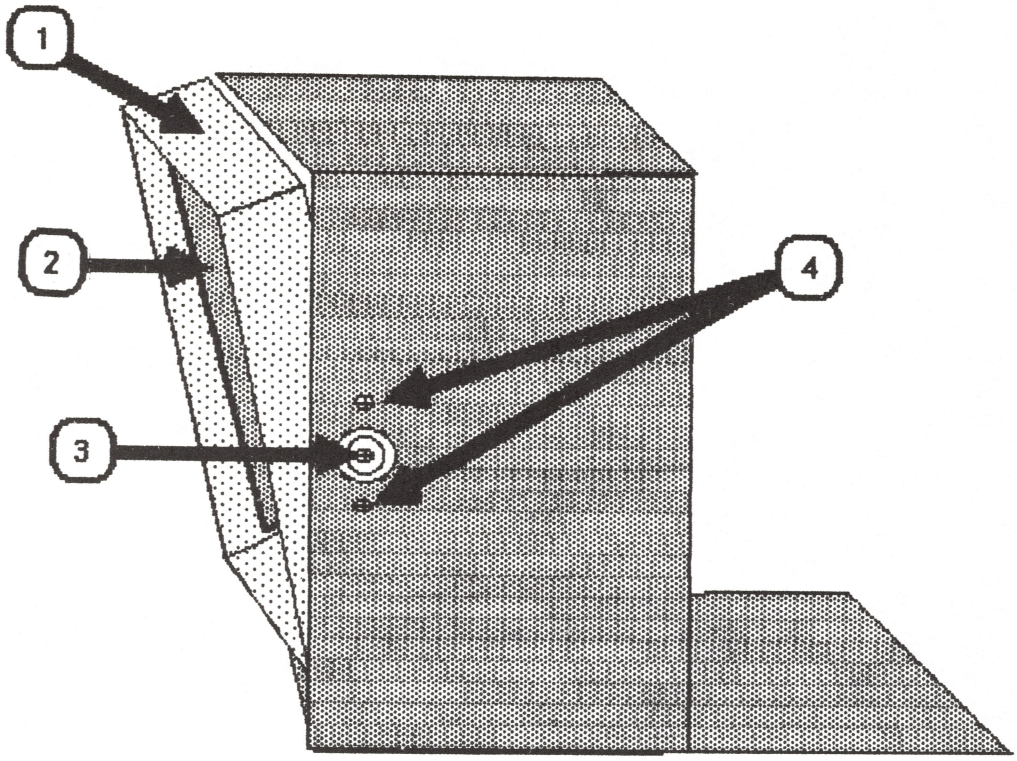

FIGURE 18

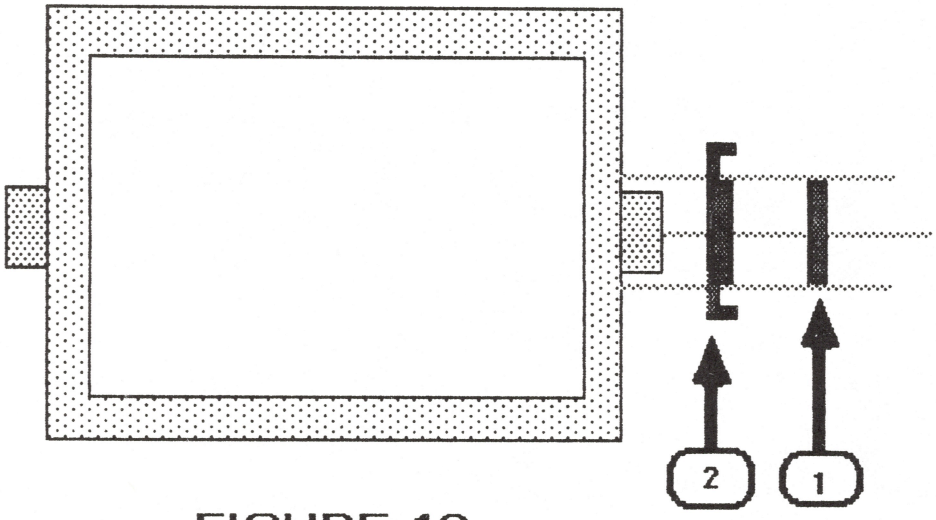

FIGURE 19

Removing the Mask

1. Disconnect the AC power cord.

2. Remove the rear enclosure.

3. Discharge and remove the CRT.

   NOTE: The mask is shown in Figure 18, #1. The metal parts that come off when removing the mask are not considered part of the mask.

4. Follow the instructions below for one side of the mask, and then the other.

   a) Support the CRT bracket (Figure 18, #2) while you loosen the axle screw (Figure 18, #3) until it clears the bracket. Set the bracket aside.

   b) Completely remove the axle screw (Figure 18, #3).

   c) Remove the two screws shown in Figure 18, #4.

5. Pull the mask forward and out of the monitor chassis.

6. Remove the metal ring (Figure 19, #1) and bracket (Figure 19, #2) from the mask axles on both sides of the mask.

Replacing the Mask

1. Place the metal brackets (Figure 19, #2) and rings (Figure 19, #1) back onto both mask axles.

2. Hold the brackets and rings in place as you slide the mask back into the chassis.

3. Follow these instructions for both sides of the mask:

   a) Replace the two screws shown in Figure 18, #4.

   b) Place the CRT bracket (Figure 18, #2) inside the mask with the screw holes adjacent to the screw holes located at the upper and lower corners of the mask.

   c) Replace the axle screw (Figure 18, #3).

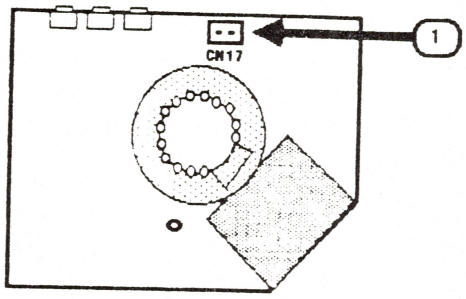

FIGURE 20

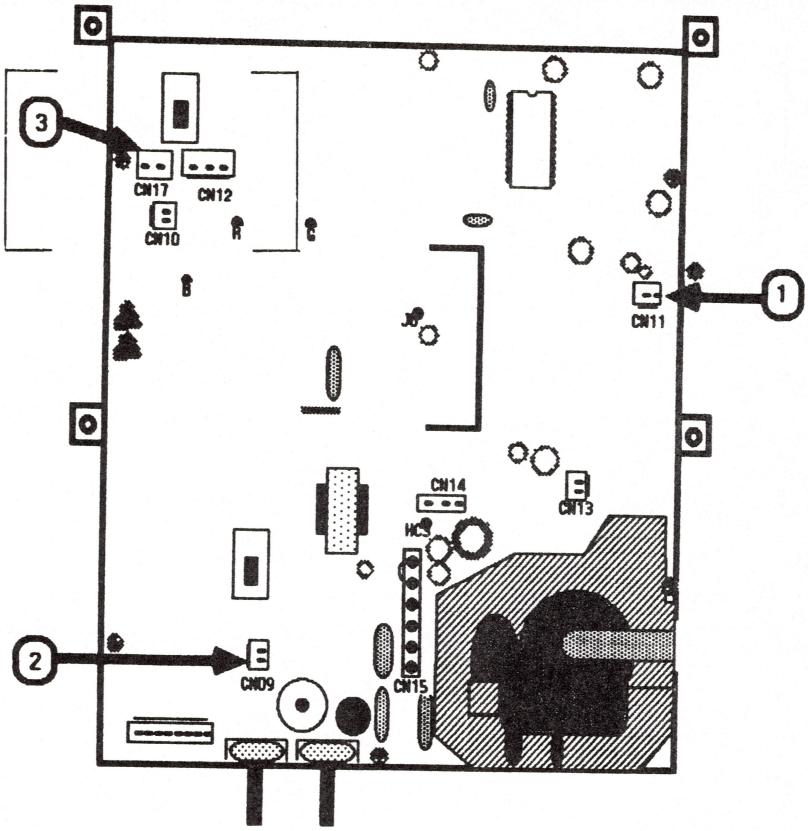

FIGURE 21

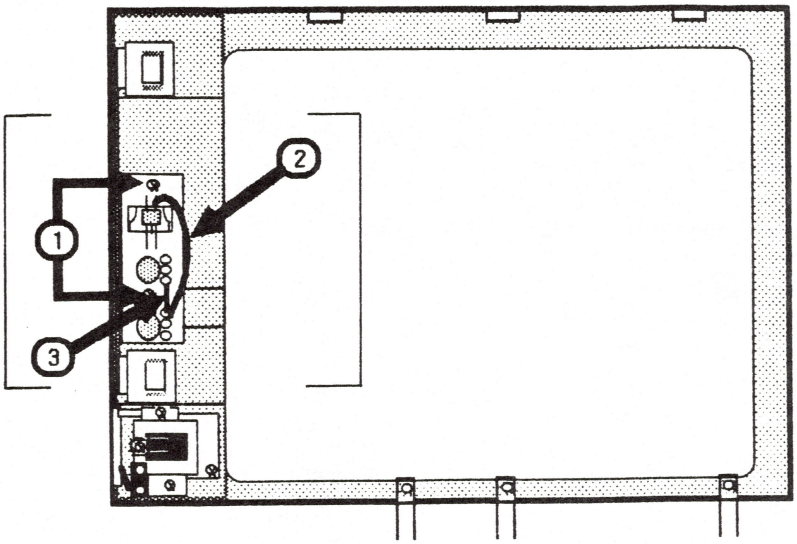

FIGURE 22

Removing and Replacing the Brightness and Contrast Control Knobs

1. Insert a flatblade screwdriver under the knob and gently pry until it is loose enough to pull off by hand.

2. To replace the knob, line up the inside of the knob with the shaft that it fits onto and slide it all the way onto the shaft.

Removing the Brightness/Contrast Control

1. Disconnect the AC cord.

2. Remove the brightness and contrast knobs.

3. Remove the rear enclosure.

4. Follow steps 4 through 8 of **"Discharging the CRT."**

5. As you face the back of the monitor you will see two potentiometers (brightness and contrast) and one slide switch (green only) attached to a metal plate located on the left side of the monitor. Use a pair of diagonal cutters to cut any cable ties binding the wires of those three components together.

6. Disconnect the following the connectors:

   a) CN17 (CRT socket board) -- Figure 20, #1
   NOTE: On the AppleColor Monitor 100 Rev. A, CN17 is located on the logic board (Figure 21, #3).

   b) CN11 (logic board) -- Figure 21, #1

   c) CN09 (logic board) -- Figure 21, #2

7. Carefully bring the wires outside of the chassis.

8. Remove the two screws (Figure 22, #1) that mount the metal plate to the front bezel and remove the plate.

9. If you are removing the brightness control from an AppleColor Monitor 100 Rev. 0, locate the wire (Figure 22, #2) that connects the brightness pot to the slide switch. Desolder and remove the wire from the brightness pot contact. If you are removing the contrast control, skip to step 11.

NOTE: The wire is not present on the AppleColor Monitor 100 Rev. A. Instead, there is a resistor connecting the brightness pot to the contrast pot (Figure 22, #3). If you are removing the brightness control, desolder the end of the resistor attached to the brightness pot. If you are removing the contrast control, desolder and remove the end of the resistor attached to the contrast pot.

11. Turn the plate around and remove the mounting nut and the potentiometer.

Replacing the Brightness/Contrast Control

1. Slide the pot shaft back through its fit-through on the mounting plate.

2. Orient the pot with the contacts facing in the same direction as they are on the brightness/contrast pot and replace the mounting nut.

3. If you are replacing the brightness control, solder the wire that was previously removed to the single contact. (On the AppleColor Monitor 100 Rev. A, resolder the resistor wire to the pot from which it was disconnected).

4. Mount the plate back onto the front bezel.

5. Tie the wires together with new cable ties if you have them. Also, tie the three sets of wires to the wires extending from the On/Off switch.

6. Route the wires back through the cable clamp located just in front of the power transformer.

7. Connect the following connectors:

   a) CN17 (CRT socket board) -- Figure 20, #1
   (On the AppleColor Monitor 100 Rev. A, CN17 connects to the logic board -- Figure 21, #3).

   b) CN11 (logic board) -- Figure 21, #1

   c) CN09 (logic board) -- Figure 21, #2

8. Replace the rear enclosure.

9. Replace the knobs.

Removing the Green Only Switch

1. Follow Steps 1 through 7 of "**Removing the Brightness/Contrast Control.**"

2. If you are working on an AppleColor Monitor 100 Rev. 0, desolder and remove the wire connecting the green only switch to the brightness pot. (On the AppleColor Monitor 100 Rev. A, there is no wire on the green only switch).

3. Remove the two Phillips screws that attach the button to the metal plate. They are located at either side of the switch.

Replacing the Green Only Switch

1. Place the switch back into its fit-through on the mounting plate. The soldered contacts should be at the top.

2. Replace the two mounting screws.

3. Slide the green button back onto its shaft.

4. Solder the wire previously removed back onto outermost switch contact. **(For AppleColor Monitor 100 Rev. A, skip this step -- there is no wire.)**

5. Follow steps 4 through 9 of "**Replacing the Brightness/Contrast Control.**"

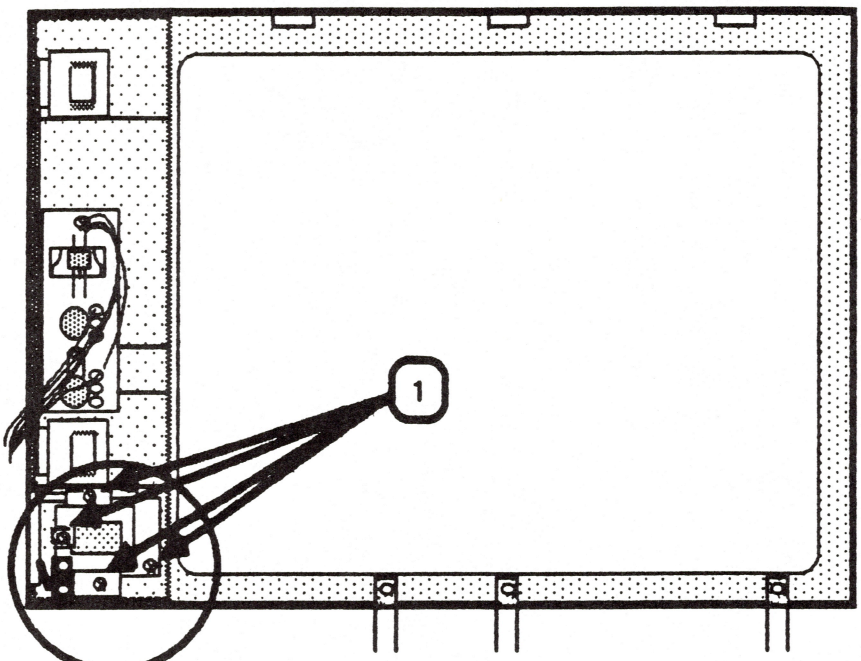

FIGURE 23

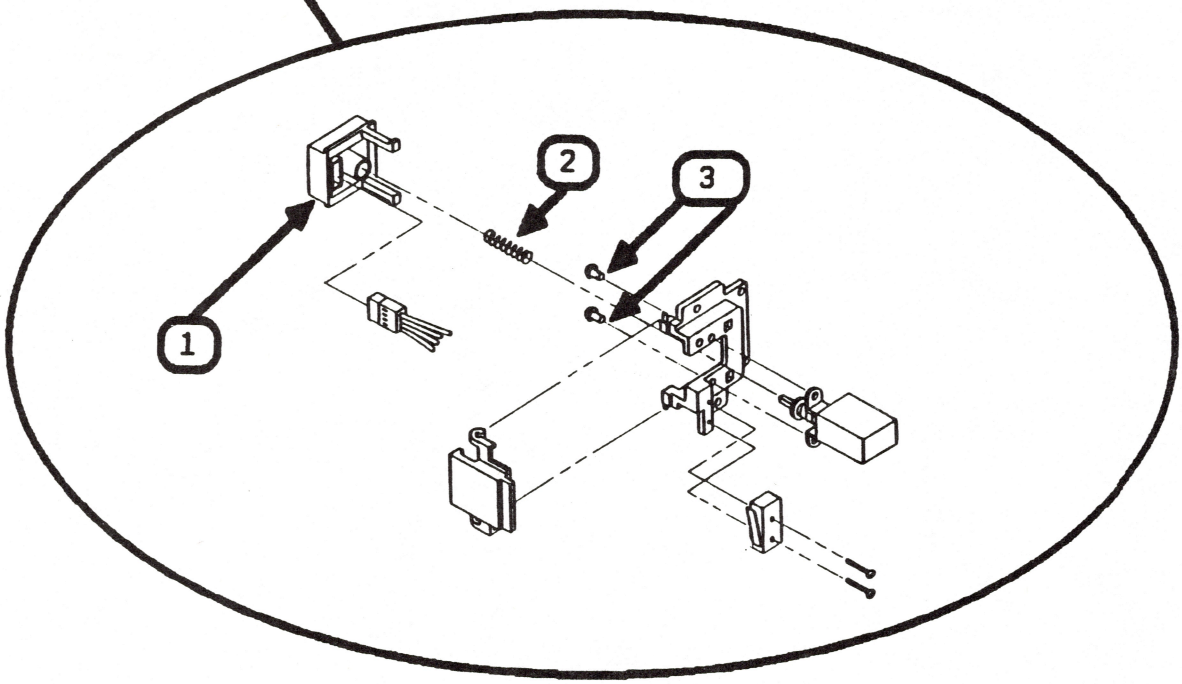

FIGURE 24

Removing the Power Button/Switch

1. Disconnect the AC power cord.

2. Remove the rear enclosure.

3. Follow steps 4 through 8 of **"Discharging the CRT."**

4. Locate the plastic mounting plate circled in Figure 23. Remove the four Phillips screws (Figure 23, #1).

5. The power button (Figure 24, #1) is attached to the plastic mounting plate by two legs at the top of the button. To release the button, push the two legs inward as you pull the button away from the mounting plate.

   NOTE: If you are removing the power switch, go to Step 7.

6. Locate the tiny PC board on the inside of the power button. This is the LED. It is attached to the button by two small Phillips screws. Remove the screws to separate the PC board from the power button.

7. Remove the small spring (Figure 24, #2) located on the power switch shaft.

8. Remove two Phillips switch mounting screws (Figure 24, #3) located at either side of the power switch shaft.

9. Follow the power switch wires back to their connector (CN02) on the component side of the power supply board. Disconnect CN02 and completely remove the switch.

   NOTE: If CN02 is too difficult to remove, follow steps 6 and 7 of "Removing the Power Supply Board" for easier access to the connector.

Replacing the Power Button/Switch

1. Orient the plastic mounting plate as it is shown in Figure 24.

2. Insert the switch into the plastic mounting plate with the wires on the right.

3. Place the spring back on the shaft of the switch (Figure 24, #2.) and replace the switch mounting screws.

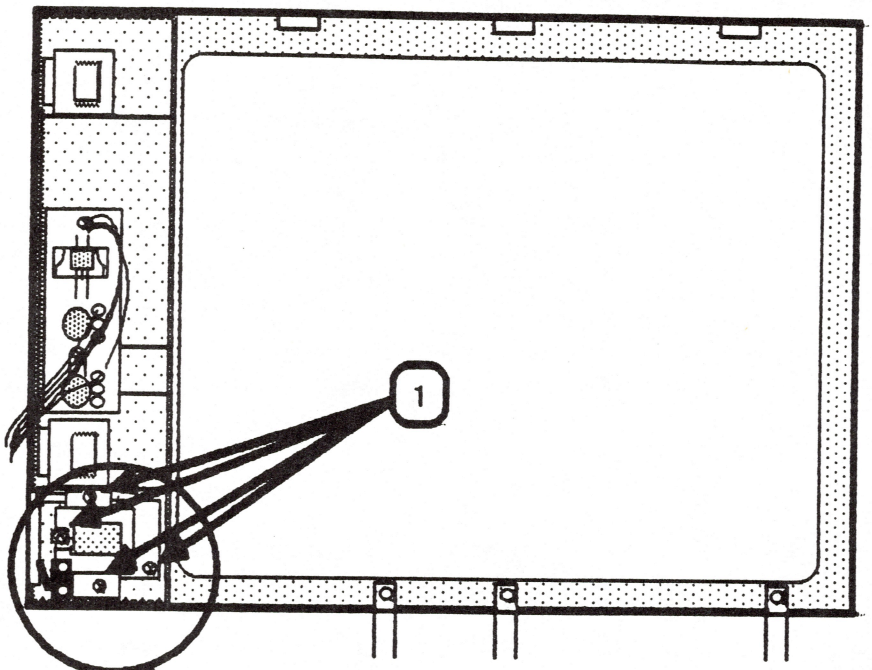

FIGURE 25

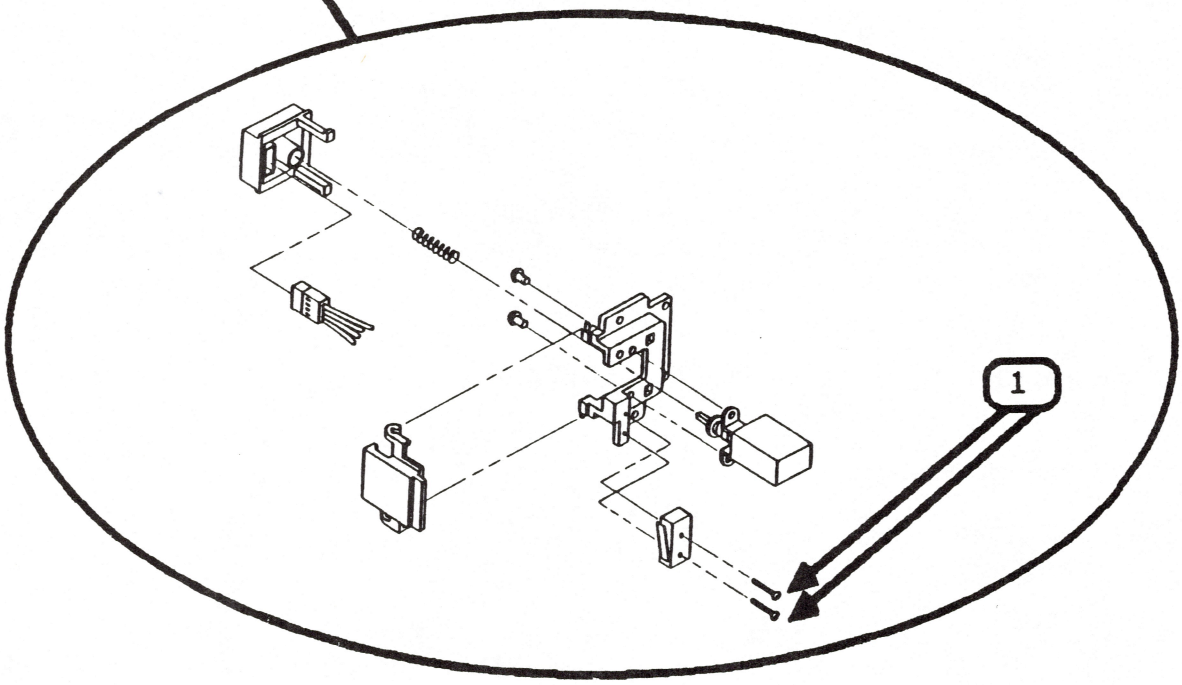

FIGURE 26

4. Hold the spring in place while you insert the power button legs back through the fit-throughs in the plastic plate. The spring fits into the hole in the back of the switch.

Removing the Tilt Motor Button/Switch

1. Disconnect the AC power cord.

2. Remove the rear enclosure.

3. Follow steps 4 through 8 of **"Discharging the CRT."**

4. Locate the plastic mounting plate circled in Figure 25. Remove the four mounting screws (Figure 25, #1).

5. Remove the two screws (Figure 26, #1) that secure the switch to the plastic plate.

6. Follow the tilt switch wires to where they connect to the power supply board by connector CN07. Disconnect CN07 from the power supply board.

   NOTE: If CN07 is too difficult to remove, follow steps 6 and 7 of "Removing the Power Supply Board" for easier access to CN07. Then continue with the next step.

7. Pull the tilt button back and away from the plastic plate until it snaps off.

Replacing the Tilt Motor Button/Switch

1. Snap the tilt button back on to its hinges.

2. Replace the two mounting screws that secure the switch to the plastic plate.

3. Connect the switch connector (CN07) to the power supply board.

4. Replace the four mounting screws to secure the plastic plate to the front bezel.

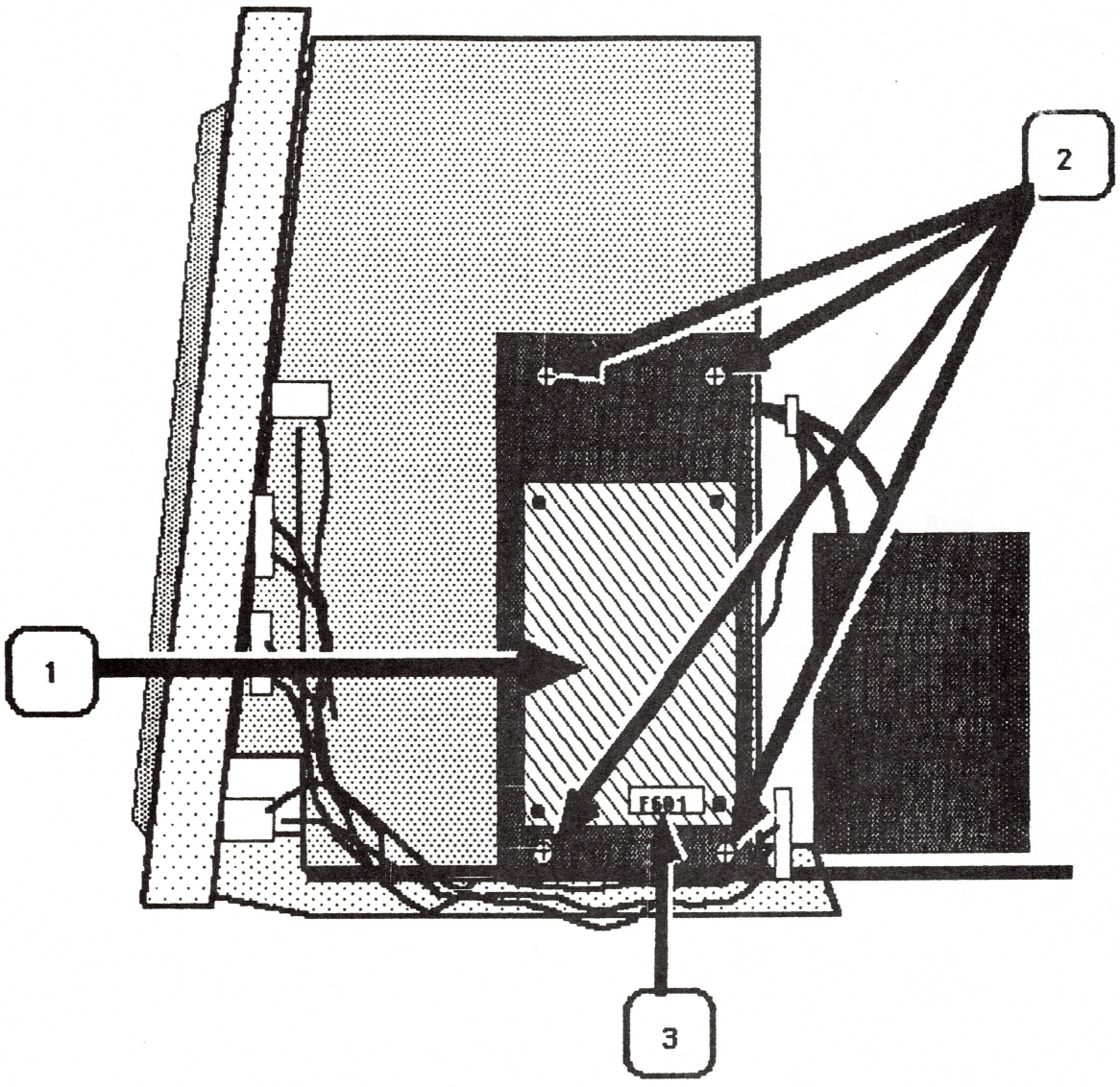

FIGURE 27

Replacing the Power Supply Fuse (F601)

The power supply fuse (F601) is mounted on the component side (inside) of the power supply board (Figure 27, #1). You do not have to remove the board completely in order to replace the fuse. The following procedures tell how to replace the power supply fuse (F601).

NOTE: Fuse F601 should be replaced with a 250V 2A Slow Blow fuse whenever you service a color monitor with a serial number below 025769.

1. Disconnect the AC power cord.

2. Remove the rear enclosure.

3. Follow steps 4 through 8 of **"Discharging the CRT."**

4. Remove the four screws (Figure 27, #2) from the power supply mounting plate.

5. Pull the bottom of the mounting plate up and over the wires leading to the control panel to gain access to the fuse.

   Figure 27, #3 shows the location of the fuse (F601) from the solder side (outside) of the power supply board.

6. Pry the fuse out of the fuse holder (away from the board).

   CAUTION: DO NOT TRY TO SLIDE THE FUSE SIDEWAYS. YOU MAY BREAK THE FUSE HOLDER.

7. Snap in the 250V 2A Slow Blow Fuse.

8. Reposition the power supply mounting plate flush against the chassis.

9. Replace the four mounting screws.

10. Replace the rear enclosure.

AppleColor Monitor 100 Technical Procedures

Section 3

Adjustments

Contents:

Logic Board Adjustments.....3.3
  Introduction.....3.3
  Materials Needed.....3.3
  Set Up Procedure.....3.5
  Evaluating the Video Test.....3.7
  Vertical Adjustments.....3.9
  Horizontal Adjustments.....3.9
  Focus Adjustment.....3.9

Color Adjustments.....3.11
  Color Bar Check.....3.11
  White Balance.....3.11

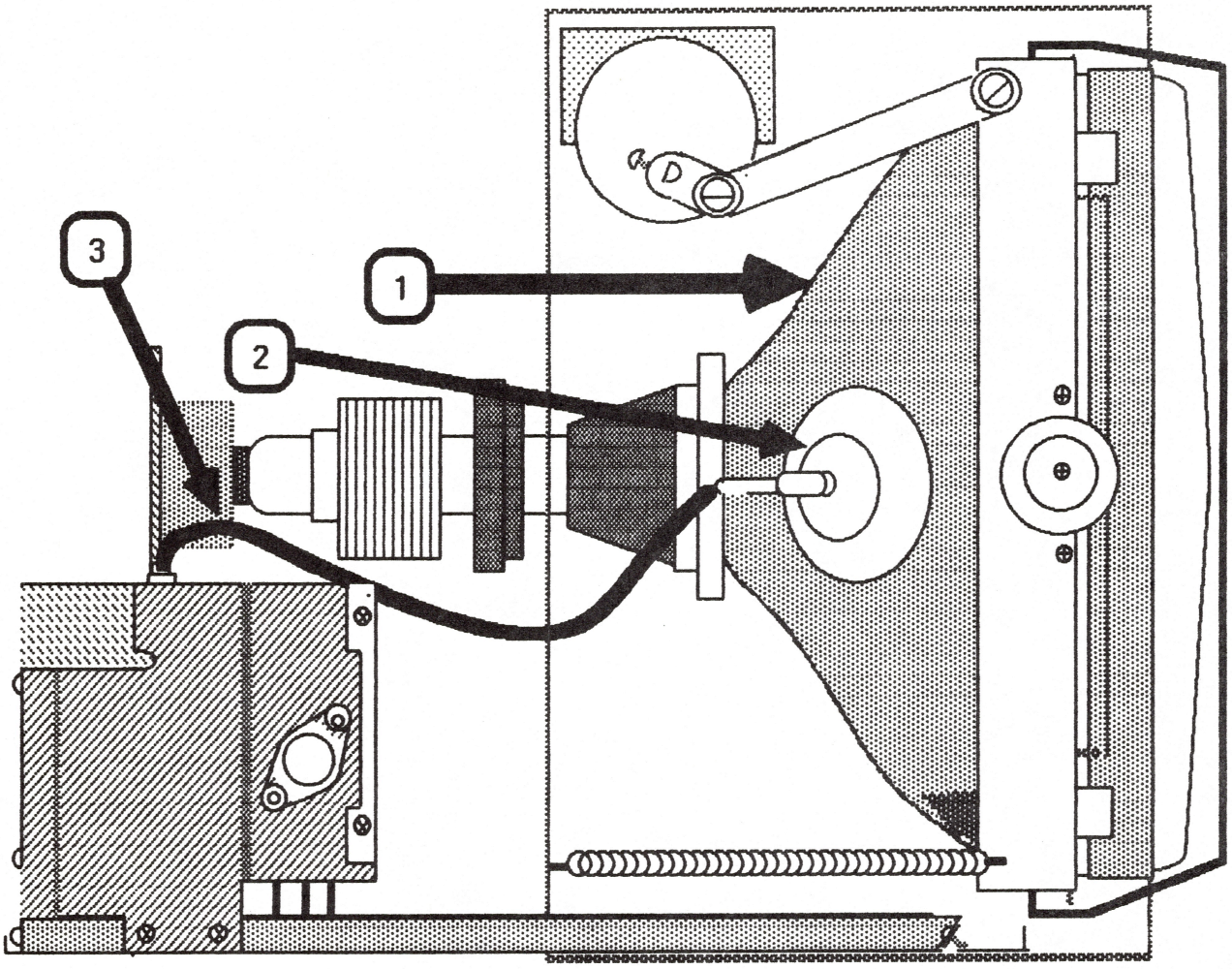

FIGURE 1

LOGIC BOARD ADJUSTMENTS

Introduction

After replacement of the logic board in the AppleColor Monitor 100 the vertical height and/or the vertical hold may need adjustment. It is important that you read all the steps completely before beginning the adjustments, as several of them interact with each other; so if it looks like a step is not working, it's possible that another step will correct the problem.

All yoke assembly adjustments have been preset by the manufacturer. Do not attempt to make any tilt, ring, or geometric adjustments on the AppleColor Monitor 100.

Materials Needed:

Working AppleColor Monitor 100
Apple IIe
Extended 80-Column Text AppleColor Card (P/N 699-0221)
Apple IIe Diagnostic ROM Card (P/N 661-94086)
Plastic hex tip iron core adjustment tool (size 0.00)
Small plastic flatblade screwdriver (tweaker)

WARNING: There are extremely high voltages on the CRT, the anode, and the anode lead. In these adjustments you will be putting your hand near these high voltage parts. It is IMPERATIVE that you watch what you are touching while making any adjustments when the power is on, otherwise injury can result. Avoid touching the CRT, anode, and the anode lead (Figure 1, #1, #2, and #3). Put one hand in your pocket or behind your back while making adjustments! Never hold on to the chassis with your free hand while making adjustments.

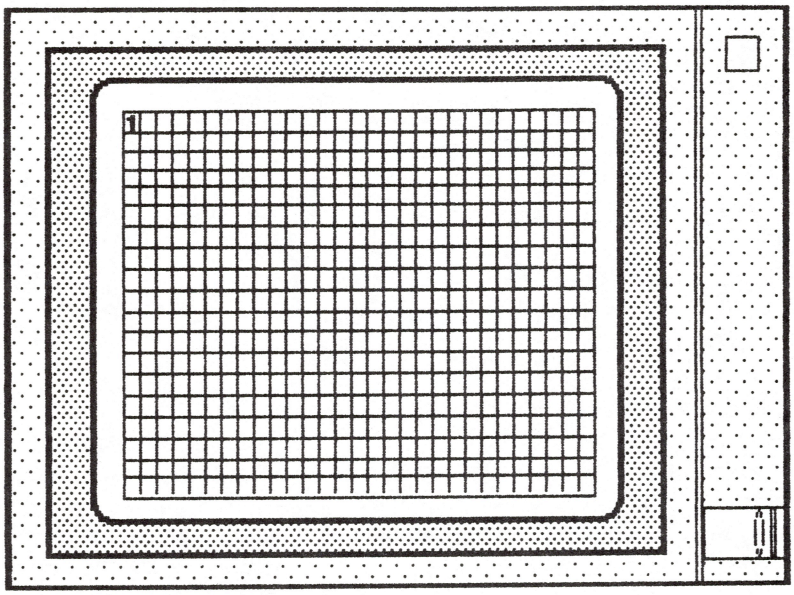

FIGURE 2

Set Up Procedure

WARNING: MAKE SURE THE POWER IS OFF ON THE MONITOR AND ON THE APPLE IIe

1. Remove the rear enclosure (Take-Apart).

2. Connect the AppleColor Monitor 100 to the Apple IIe. If you do not know how to do this, refer to the Extended 80-Column Text Card manual.

3. Insert the Apple IIe ROM card into slot 1 or 2 and make sure that the switch on top of the ROM card is pointing toward the rear of the computer. If you do not know how to do this, refer to the **Diagnostics Section of the Apple IIe Technical Procedures.**

4. Turn on the monitor and the Apple IIe. If the menu does not appear when the power is turned on, the switch on the ROM card is in the wrong position. Shut off the system, change the switch position, and turn the system back on.

5. Select the Video Tests (V) from the menu, then press the spacebar. You will now see a high resolution pattern on the screen. Numbers 1 and 2 should be alternating in the upper left-hand corner of the screen. (Figure 2.)

6. View the screen and evaluate the vertical alignment and horizontal alignment (see the next page for evaluation procedures). Determine which one needs correction and proceed to the correct adjustment. There is interaction between the two adjustments, so you might have to do both to correct any problems.

Evaluating the Video Test (Grid Pattern)

When evaluating the pattern do not use the grid boxes in the corners as examples: use the middle rows. If the corners look incorrect even after adjustments have been made, then there may be a yoke alignment problem and you should return the monitor to Apple. If the grid boxes are not all the same size there may be a linearity problem. There are no linearity adjustments; therefore, if a linearity problem still exists after all other adjustments have been made, return the monitor to Apple. Other guidelines to follow for evaluating the vertical and horizontal alignments are as follows:

1. Refer to "**Vertical Adjustments**" if:

    a) the grid boxes in the top and bottom rows do not have the same height.

    b) the grid boxes are stretched out or compressed vertically.

    c) the picture is rolling.

    d) the image is pushed more to the top or bottom.

2. Refer to "**Horizontal Adjustments**" if:

    a) the width of the grid boxes on both sides of the screen is not the same.

    b) the grid boxes are stretched out or compressed horizontally.

    c) the picture is tearing (appears ripped).

    d) the picture is pushed more to one side of the screen than the other.

    e) the picture is rolling in a diagonal movement on the horizontal plane.

NOTE: There are two ways you can view the patterns and make adjustments. One is to view the screen and reach around to the back to do the adjusting. The second way is to set up a mirror in front of the screen and view it from the rear while making the adjustments.

WARNING: IF YOU USE THE REACHING METHOD, BE SURE YOU KNOW WHAT YOU ARE TOUCHING!

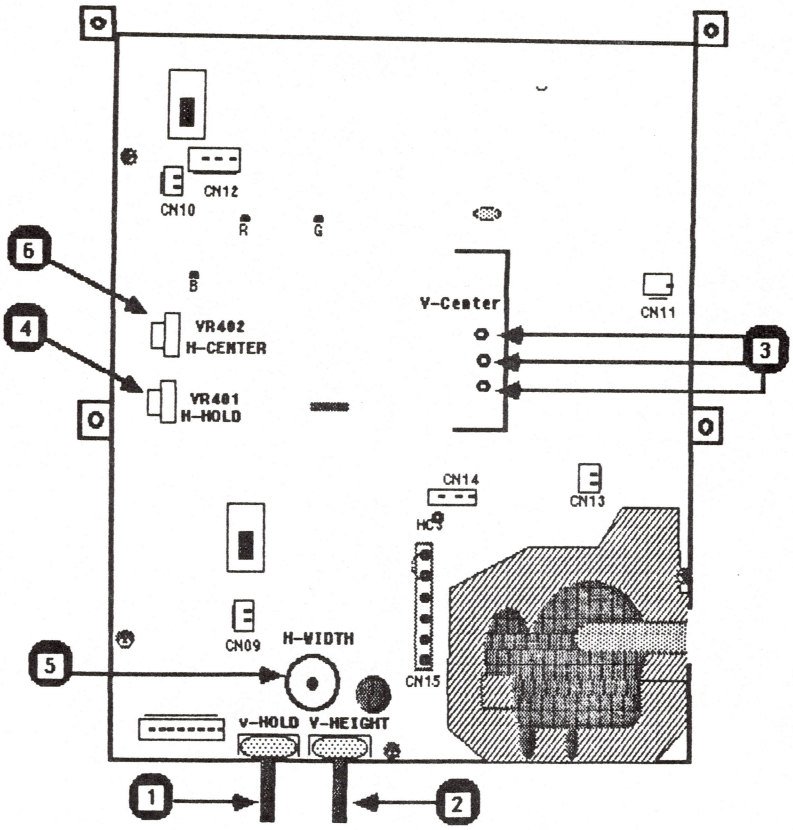

FIGURE 3

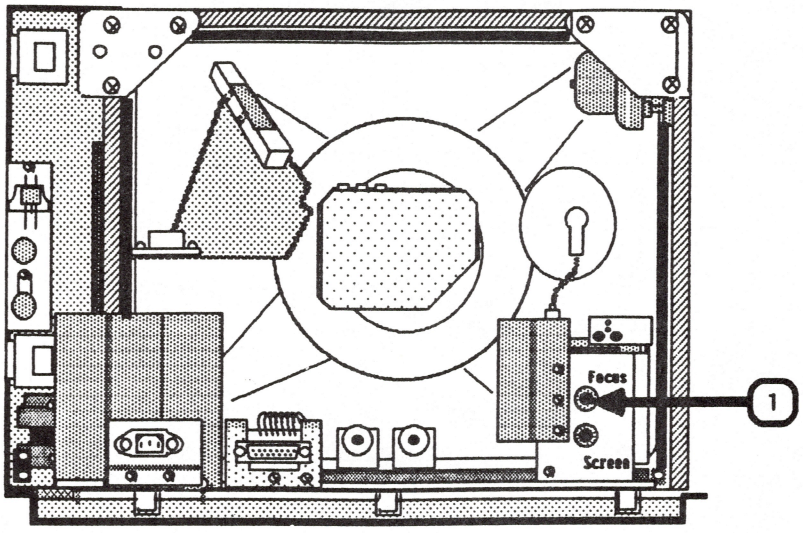

FIGURE 4

Vertical Adjustments

1. Vertical Hold: Set the vertical hold control VR301 (Figure 3, #1) to the mechanical center by turning it all the way to the left, then to the right, then back to the center of the range between left and right of its rotation. This should lock the picture on the screen and prevent any rolling.

   Turn the monitor off and back on, to make sure the vertical hold is secure.

2. Vertical Height: If the vertical height of the image is incorrect, then adjust V-HEIGHT VR302 (Figure 3, #2) until the picture is about 1/4 inch away from the top and bottom edges of the screen.

3. Vertical Center: If the vertical position of the entire image is off, carefully connect the H-C4 connector (Figure 3, #3) to the best position pin to correct this problem. (On the AppleColor Monitor 100 Rev. A, the three pins are not as perfectly aligned as those shown in Figure 3, #3). BE CAREFUL, IT IS CLOSE TO THE CRT NECK!

Horizontal Adjustments

1. Horizontal Hold: If the picture on the tube is not locked and is tearing, adjust H-HOLD R402 (Figure 3, #4).

2. Horizontal Width: The image should be about 1/4 inch away from each side of the screen. If the width of the image looks too narrow or too wide, adjust the H-WIDTH L406 (Figure 3, #5) until you have the desired width.

3. Horizontal Center: If the image is too far to one side of the screen, adjust H-CENTER VR402 (Figure 3, #6) until the image is centered.

Focus Adjustment

If the picture on the screen is blurry adjust the FOCUS pot, which is located at the back of the flyback transformer. (Figure 4, #1.)

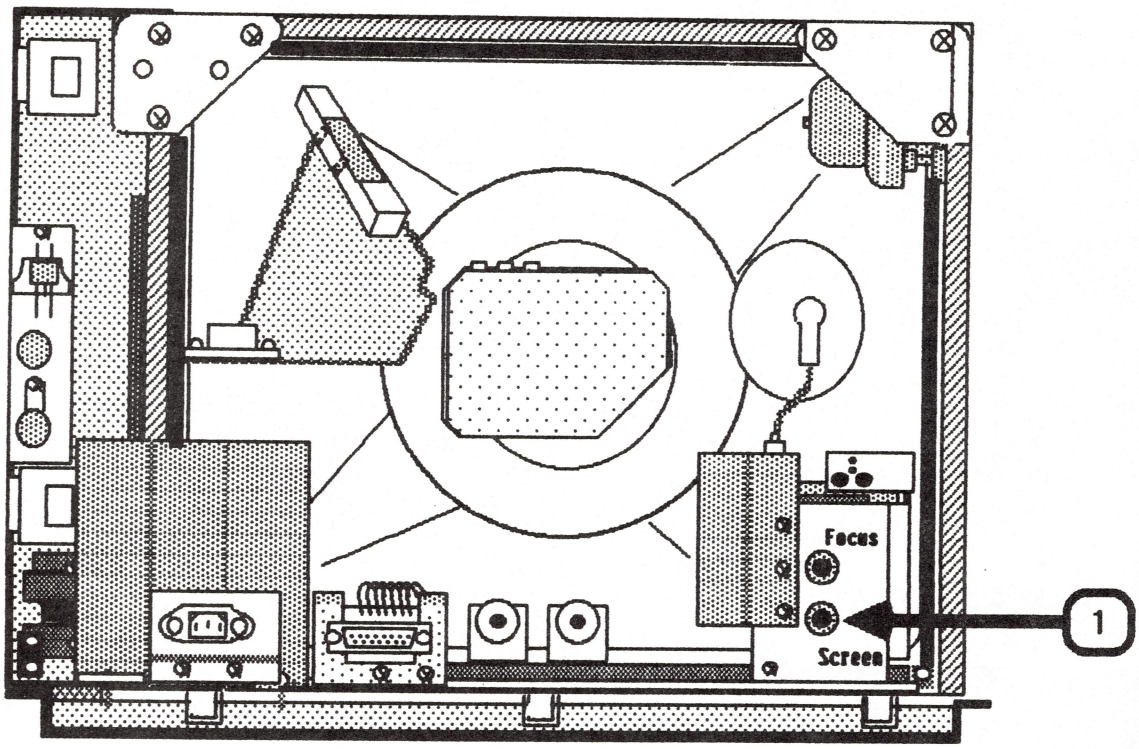

FIGURE 5

COLOR ADJUSTMENTS

Color Bar Check

1. Insert the Extended 80-Column Text/AppleColor Card into the auxiliary slot of the Apple IIe. If you do not know how to do this, refer to the user's manual for the card.

2. Locate the two DIP switches on the Extended 80-Column Card and switch both levers to the lower (bottom) position.

3. Replace the Apple IIe lid.

4. Insert the Extended 80-Column Text AppleColor Card "Demo Drivers Diskette" (ProDOS Based) into the disk drive.

5. Turn on the Apple IIe.

6. Turn on the AppleColor Monitor 100.

7. When the menu appears, press the down arrow on the keyboard to select **"DHR.COLORS"**, then press **"RETURN"**.

   The monitor will display 16 color bars with the name of the color beneath each bar.

8. Make sure that the colors match their names. If they do not match, follow the procedures below to adjust the color.

White Balance

Proper color adjustment is achieved by obtaining "white balance." The white balance is obtained by adjusting the screen potentiometer of the flyback transformer along with all the pots located on the CRT socket board. For this procedure you do not need to connect the monitor to the Apple IIe.

WARNING: MAKE SURE THAT THE POWER IS OFF!

1. Remove the rear enclosure (Refer to **Take-Apart Section**).

   NOTE: Do not connect the DB-15 video cable to the monitor.

2. Connect the AC power cord to the back of the monitor and to the wall outlet.

3. Turn the SCREEN pot (Figure 5, #1) counterclockwise as far as it will turn.

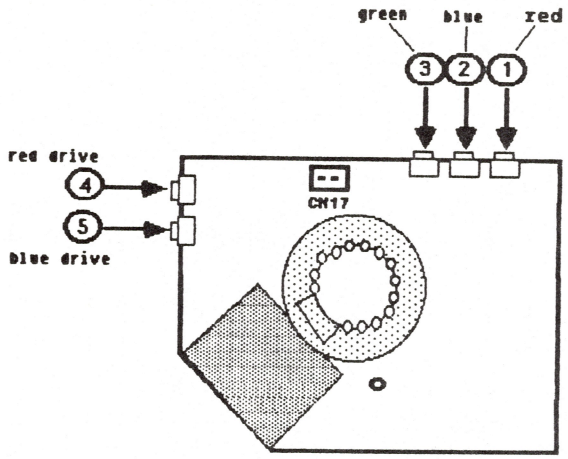

FIGURE 6

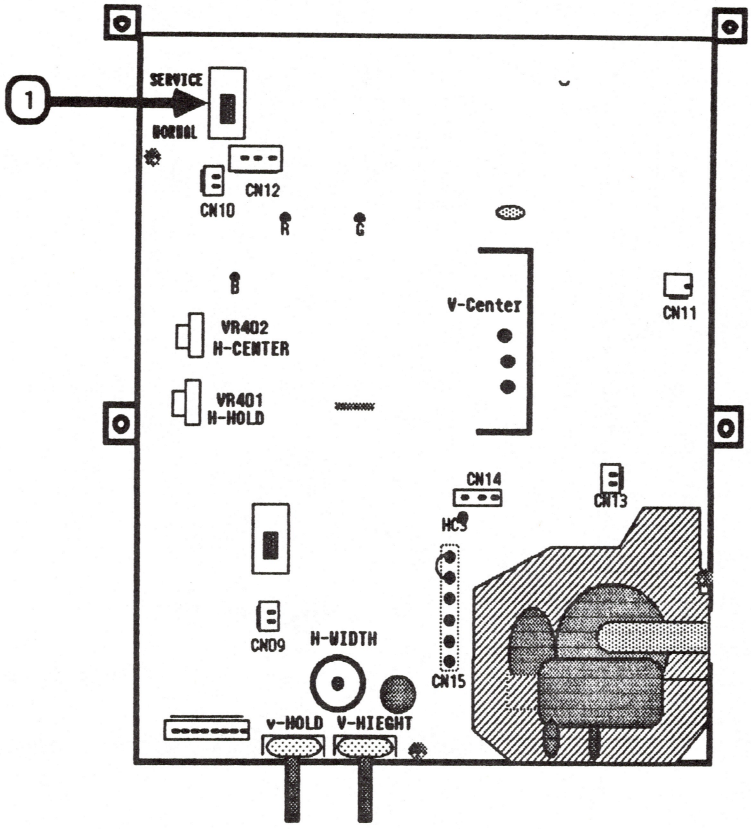

FIGURE 7

4. Adjust the following pots, located on the CRT socket board, to their mechanical centers by turning them all the way to the left, then to the right, then back to the center of the range between left and right:

   a) VR501 (Red Bias) -- Figure 6, #1

   b) VR502 (Green Bias) -- Figure 6, #2

   c) VR503 (Blue Bias) -- Figure 6, #3

   d) VR504 (Red Drive) -- Figure 6, #4

   e) VR505 (Blue Drive) -- Figure 6, #5

5. Use the eraser end of a pencil, or another nonconductive tool, to push Switch (SW) 101 (Figure 7, #1) to the SERVICE position.

6. Turn on the monitor.

7. Observing the center of the screen, turn the SCREEN pot gradually clockwise until you see a horizontal line.

   NOTE: Do not turn the SCREEN pot until the line is glowing, but just until you see a fine, solid line.

   THE LINE SHOULD APPEAR WHITE. If the line is not white, repeat step 7. Watch closely to see which color appears first. Then, adjust the appropriate bias pot(s) (listed in step 4, above) until that color is defeated (no longer appears). If another color appears, repeat this step until the line is white.

8. Turn the SCREEN pot slightly clockwise to make sure that the line remains white. If it is not white adjust the appropriate color bias pot to obtain a white line.

9. Turn the SCREEN pot counterclockwise until the white line disappears.

10. Turn off the monitor and push switch SW 101 (Figure 7, #1) back to the NORMAL position.

11. Turn the monitor back on and repeat the steps listed in the "Color Bar Check" in this manual.

AppleColor Monitor 100 Technical Procedures

Section 4

Troubleshooting Guide

Contents:

Introduction....4.2
Symptoms:
- No raster....4.2
- One horizontal line appears....4.2
- One vertical line appears....4.2
- Raster deformed abnormally....4.2
- Abnormal raster with winding or excessive picture fluctuation....4.3
- Spot remains with monitor off....4.3
- Brightness range abnormal or picture is flashing....4.3
- Raster size small picture abnormally bright....4.3
- No vertical synchronization....4.3
- Raster not centered....4.3
- No picture no contrast....4.3
- Picture characters inclined....4.3
- Picture characters shiver....4.4
- 15 or more seconds for picture to appear....4.4
- Picture appears/disappears....4.4
- Horizontal linearity bad....4.4
- Vertical linearity bad....4.4
- Won't focus....4.4
- Colors not right....4.4

INTRODUCTION

This is the troubleshooting section. It consists of a symptom chart, showing the symptom and an action to be taken to rectify the problem. The best way to use this section is:

1. Look on the chart to find the symptom that matches what the defective monitor is doing.

2. Try the recommended action.

SYMPTOM	ACTION
NO RASTER	Replace fuse 601 on the P/S board with a **250V 2A Slow Blow Fuse.**
	Check that all connectors are secure on the P/S and logic board.
	Replace the Power Switch.
	Replace the P/S board.
	Replace the logic board.
	Replace the power transformer.
	Replace the CRT.
ONE HORIZONTAL RASTER LINE APPEARS	Check to make sure that SW101 on the logic board is in the NORMAL position.
	Replace the logic board.
	Replace the CRT.
ONE VETICAL RASTER LINE APPEARS	Replace the logic board.
	Replace the CRT.
RASTER DEFORMED ABNORMALLY	Replace the CRT.

SYMPTOM	ACTION
ABNORMAL RASTER WITH WINDING OR EXCESSIVE PICTURE FLUCTUATION	Replace the logic board.
SPOT REMAINS WHEN UNIT IS OFF	Replace the logic board.
BRIGHTNESS RANGE ABNORMAL OR PICTURE IS FLASHING	Replace the logic board. Replace the P/S board. Replace the power transformer.
RASTER SIZE SMALL PICTURE ABNORMALLY BRIGHT	See **Section 3, "Adjustments."** Replace the logic board.
NO VERTICAL SYNCHRONIZATION	See **Section 3, "Adjustments."** Replace the logic board.
RASTER NOT CENTERED	See **Section 3, "Adjustments."** Replace the logic board. Replace the CRT.
NO PICTURE NO CONTRAST	Replace the logic board.
PICTURE / CHARACTERS INCLINED	See **Section 3, "Adjustments".**

SYMPTOM	ACTION
FINE NOISES IN PICTURE. CHARACTERS SHIVER.	Make sure the ground strap is secured to the power transfomer. Replace the logic board.
FIFTEEN OR MORE SECONDS FOR PICTURE TO APPEAR	Replace the CRT.
PICTURE APPEARS DISAPPEARS	Replace the logic board. Replace the CRT.
HORIZONTAL LINEARITY BAD	Replace the logic board. Replace the CRT.
VERTICAL LINEARITY BAD	Replace the logic board. Replace the CRT.
WON'T FOCUS	Replace the logic board. Replace the CRT.
COLORS NOT RIGHT	See **Section 3, "Adjustments."**

AppleColor Monitor 100 Technical Procedures

Section 5

Illustrated Parts List

The figures and lists below include all piece parts that can be purchased separately from Apple for the AppleColor Monitor 100, along with their part numbers. These are the only parts available from Apple. Refer to your Apple Service Programs manual for prices.

Contents:

AppleColor Monitor 100.....5.3
Monitor Cables.....5.5

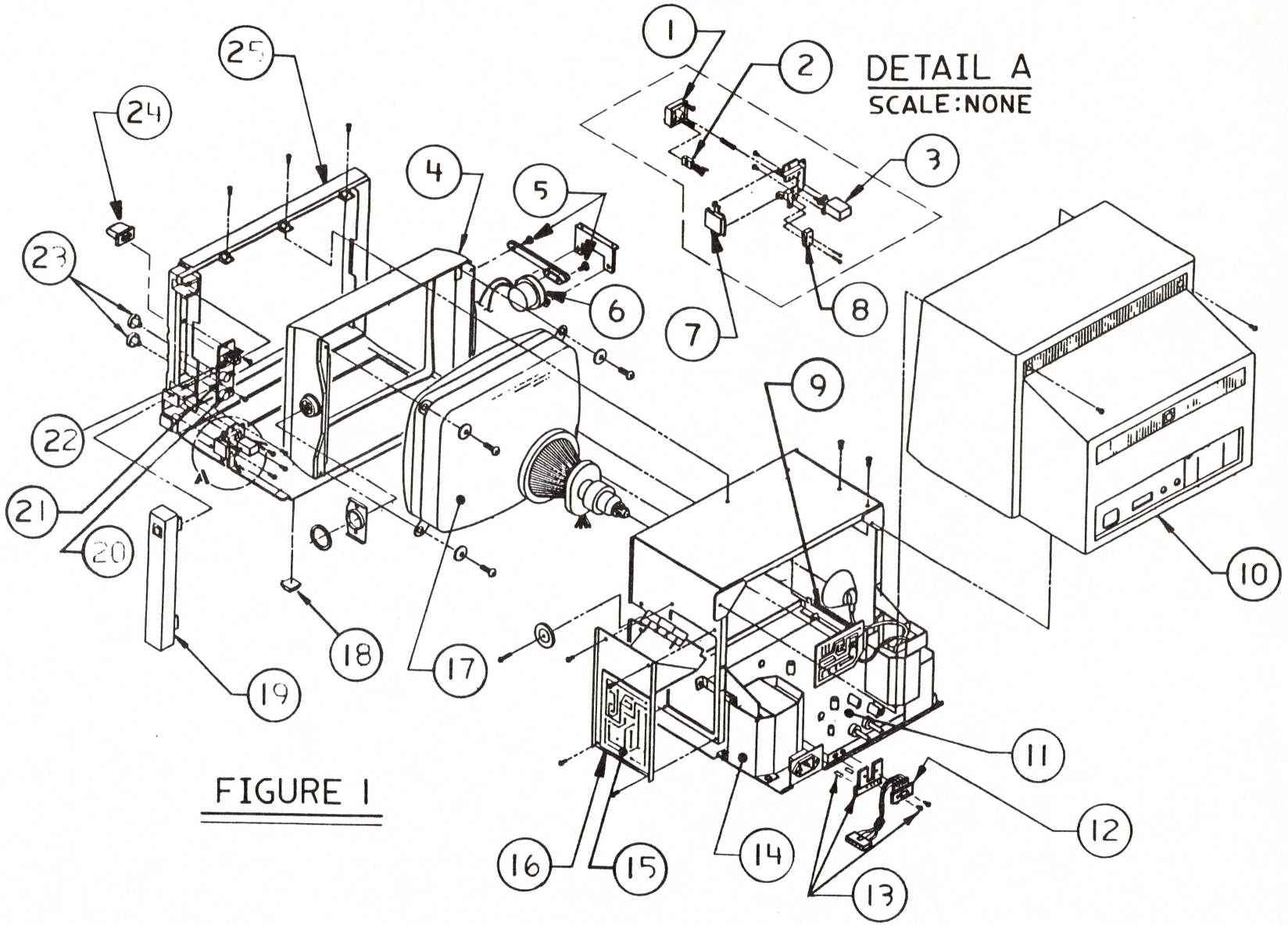
DETAIL A
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FIGURE 1

APPLECOLOR MONITOR 100 - (Figure 1)

Item	Part No.	Description
1	815-0543	Power Switch Bottom
2	970-1000	LED Assembly
3	970-0995	Power Switch
4	815-0549	Mask
5	931-0003	Screw, shldr, brass, RH thread
6	970-0997	Tilt Motor
7	815-0544	Button, Tilt Switch
8	970-0996	Tilt Motor Switch
9	970-0998	Tilt Loading Spring
10	815-0546	Rear Enclosure
11	661-0238	Logic Board, Rev. O
	661-0292	Logic Board, Rev. A
12	970-0999	DB15 Connector, AppleColor Monitor 100, Rev. 0
	076-0196	DB15 Connector, AppleColor Monitor 100, Rev. A
13	076-0235	Bracket Assembly, DB15 Connector
14	076-8119	Power Transformer
15	740-0204	Fuse, 2A UL, CSA
16	661-0237	Power Supply Board
17	076-8120	CRT/Yoke Assembly
18	865-0020	Rubber Foot
19	815-0545	Control Panel Door
20	970-0990	Brightness Control
21	970-0991	Contrast Control
22	970-0994	Green Only Switch
23	815-0547	Contrast/Brightness Control Knob
24	815-0550	Green Only Button
25	815-0542	Front Bezel

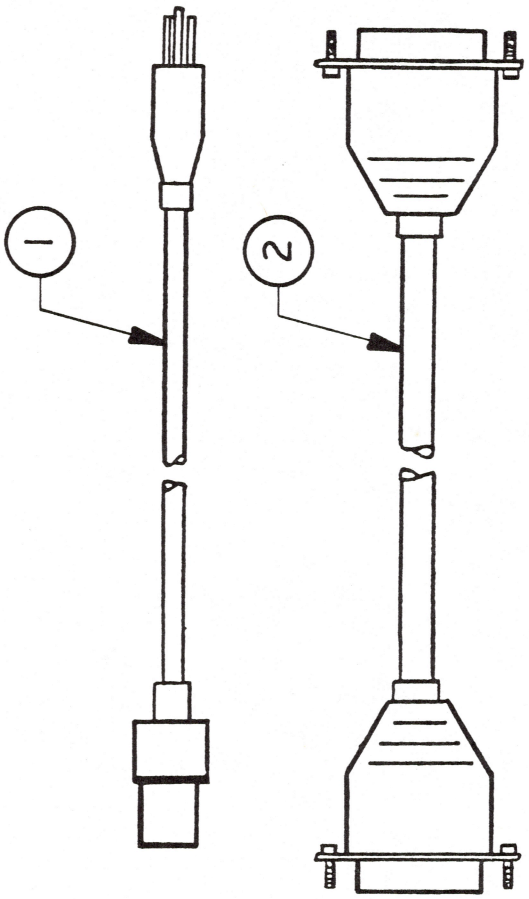

FIGURE 2

APPLECOLOR MONITOR 100 - CABLES (Figure 2)

Item	Part No.	Description
1	970-0876	Cable, AC Power Cord, AppleColor Monitor 100
2	590-0536	RGB Video Cable

Flat Panel Display

APPLE IIc FLAT PANEL DISPLAY TECHNICAL PROCEDURES

TABLE OF CONTENTS

Section 1 - Troubleshooting

Introduction.....1.1
Flat Panel Display Troubleshooting Flowchart.....1.2

Section 2 - Diagnostics

(See Note).....2.1

Section 3 - Take-Apart

Introduction.....3.3
Opening the Flat Panel Display Case.....3.5
Removing the Flat Panel Liquid Crystal Display (LCD).....3.5
Installing the Flat Panel Liquid Crystal Display (LCD).....3.7
Removing the Contrast Card.....3.9
Installing the Contrast Card.....3.9
Removing the Inverter Switch Cover.....3.11
Installing the Inverter Switch Cover.....3.11
Removing the Connector Box.....3.13
Installing a Connector Box.....3.13
Removing the Ribbon Cable.....3.15
Installing the Ribbon Cable.....3.17

Section 4 - Illustrated Parts List

Illustrated Parts List and Diagrams.....4.2

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Apple IIc Flat Panel Display Technical Procedures

Section 1

Troubleshooting

Contents:

Introduction.....1.2
Symptom Table.....1.3

INTRODUCTION

The Apple IIc Flat Panel Display consists of the following electronic replaceable modules:

1. The Liquid Crystal Display (LCD)

2. The contrast card

3. The connector box

4. The ribbon cable

The Symptom Table on the following page shows possible failure symptoms and an action to be taken to rectify the problem. The best way to use this table is:

1. Look on the chart to find the symptom shown by the defective Flat Panel Display.

2. Try the recommended actions in the order in which they are listed.

SYMPTOM	ACTION
NO DISPLAY	Check that all connectors are secure inside the display panel. Check that the ribbon cable is connected inside the connector box. Replace the Liquid Crystal Display Replace the connector box. Replace the ribbon cable
NOT ABLE TO ADJUST CONTRAST	Replace the contrast card
INVERTER SWITCH NOT WORKING	Replace the contrast card
GARBAGE DISPLAY	Replace the connector box Replace the Liquid Crystal Display Replace the contrast card

Apple IIc Flat Panel Display Technical Procedures

Section 2

Diagnostics

NOTE: USE THE APPLE IIc DIAGNOSTIC DISKETTE (VIDEO TEST) TO TEST THE FLAT PANEL DISPLAY. REFER TO THE APPLE IIc TECHNICAL PROCEDURES IF YOU DO NOT KNOW HOW TO USE THE DIAGNOSTIC DISKETTE.

Apple IIc Flat Panel Display Technical Procedures

Section 3

Take-Apart

Contents:

Introduction.....3.3
Opening the Flat Panel Display Case.....3.5
Removing the Flat Panel Liquid Crystal Display (LCD).....3.5
Installing the Flat Panel Liquid Crystal Display (LCD)...3.7
Removing the Contrast Card.....3.9
Installing the Contrast Card.....3.9
Removing the Inverter Switch Cover.....3.11
Installing the Inverter Switch Cover.....3.11
Removing the Connector Box.....3.13
Installing a Connector Box.....3.13
Removing the Ribbon Cable.....3.15
Installing the Ribbon Cable.....3.17

INTRODUCTION

The Flat Panel Display is a peripheral product for the Apple IIc Computer. It is made up of two major modules: the display panel (Figure 1, #1) and the connector box (Figure 1, #2). Figure 1, #3 shows the flat ribbon cable which connects the two modules. The Flat Panel Display is powered by the Apple IIc extended video port; **no additional power source is required**.

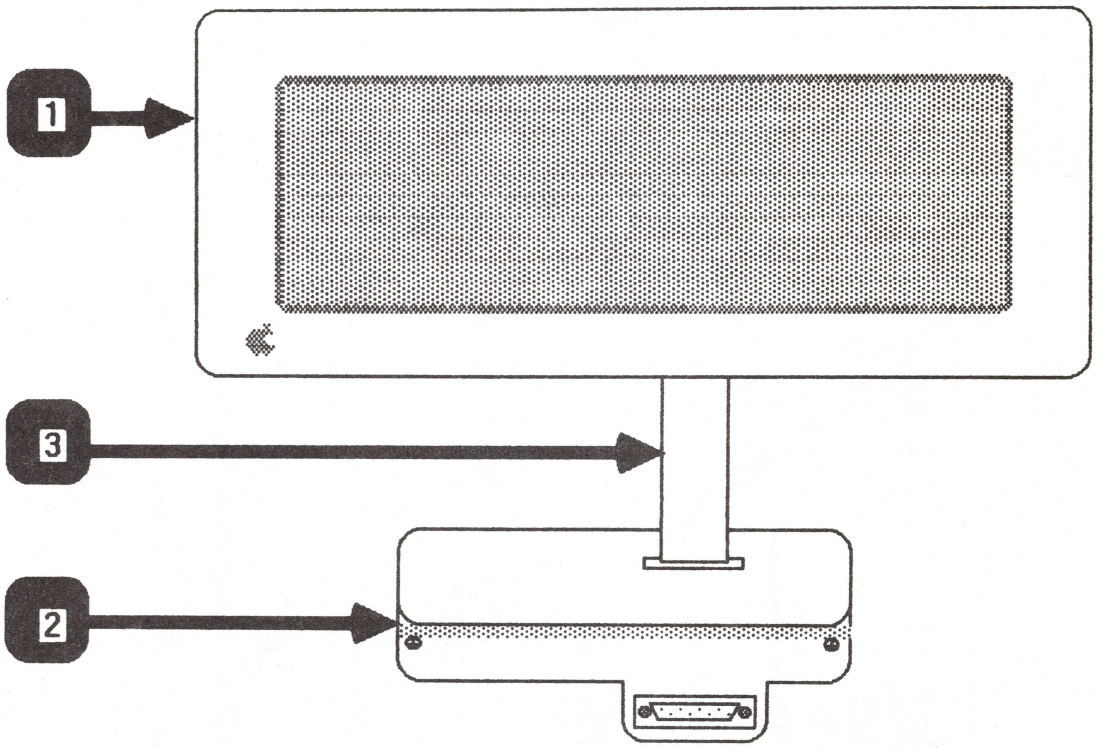

FIGURE 1

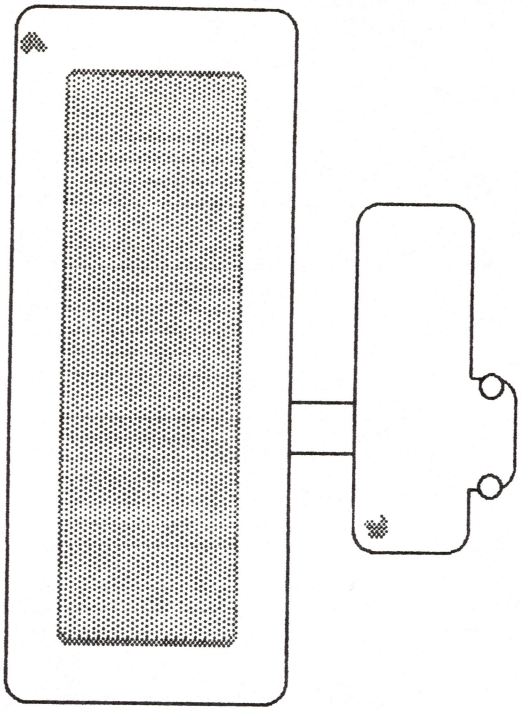

FIGURE 2

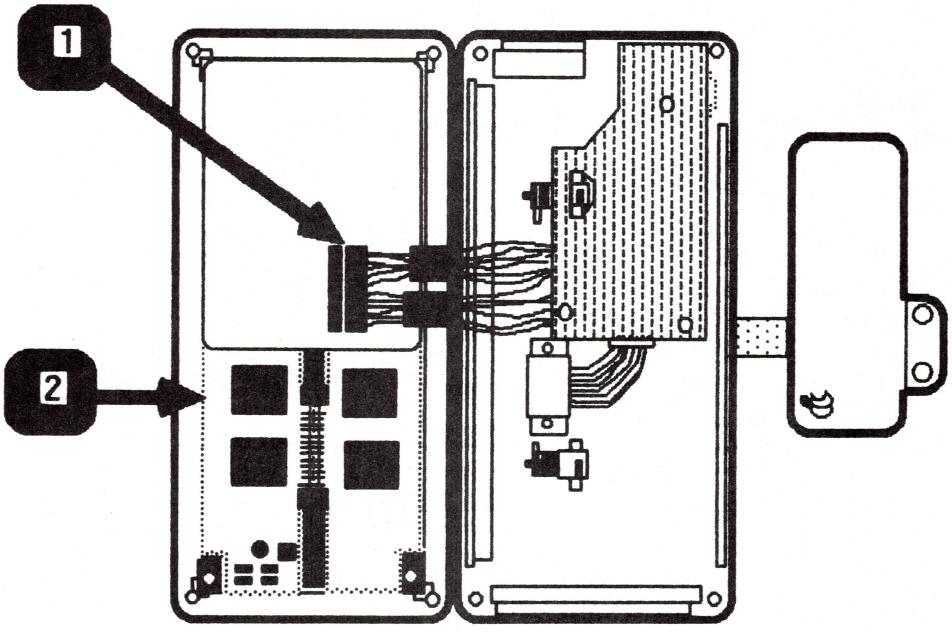

FIGURE 3

OPENING THE FLAT PANEL DISPLAY CASE

1. Place the Flat Panel Display, face down, on a protective foam pad.

2. Remove the four Phillips screws from the corners of the case back.

NOTE: There is a cable inside the case which connects the front half to the back half. This cable is located at the middle of the display and is about two inches long.

3. Flip the panel over (lens facing up) and carefully pry the sides of the case until the front half snaps off.

4. Orient the Flat Panel Display as shown in Figure 2.

5. Turn the top half of the panel over in the same way you would open a book. (See Figure 3).

REMOVE AND INSTALL FLAT PANEL LIQUID CRYSTAL DISPLAY (LCD)

Remove (LCD)

1. Follow the steps listed in "Opening the Flat Panel Display Case" (above).

2. Disconnect the contrast card connector (Figure 3, #1) from the LCD (Figure 3, #2).

3. Carefully pry the flat panel LCD (Figure 3, #2) out of the case.

4. If the case lens comes loose from the front panel, follow these steps to repair it:

   a) Place the lens in the panel so that the raised side protrudes through the front of the panel.

   b) Press down on the lens until the plastic posts come through the holes at the borders of the lens.

   c) Put a small drop of fast drying glue for plastic bonding (preferably LOCTITE) on each plastic post. Hold the lens firmly against the panel until the glue is dry.

   d) Use a plastic lens cleaner to clean both sides of the lens.

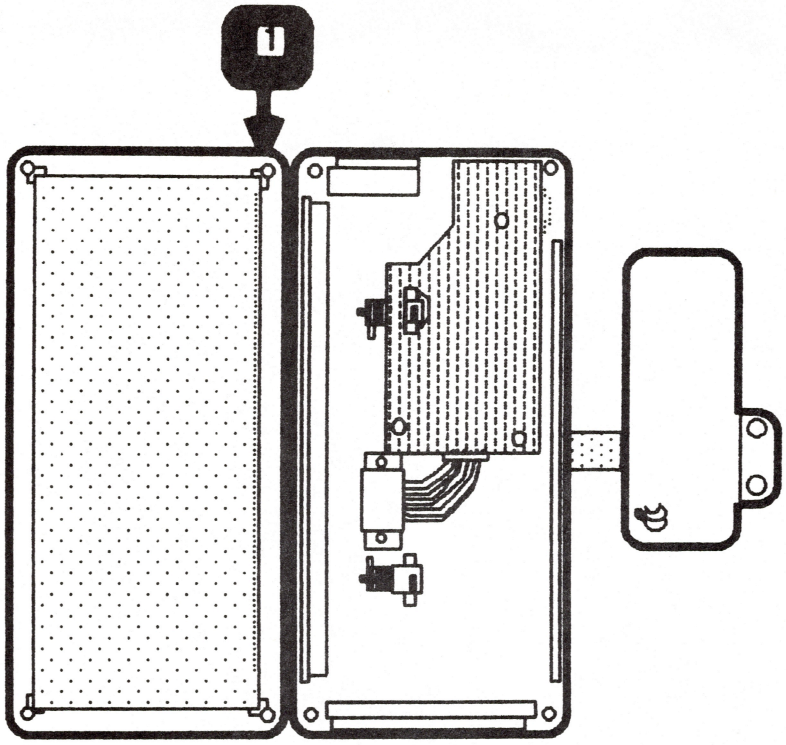

FIGURE 4

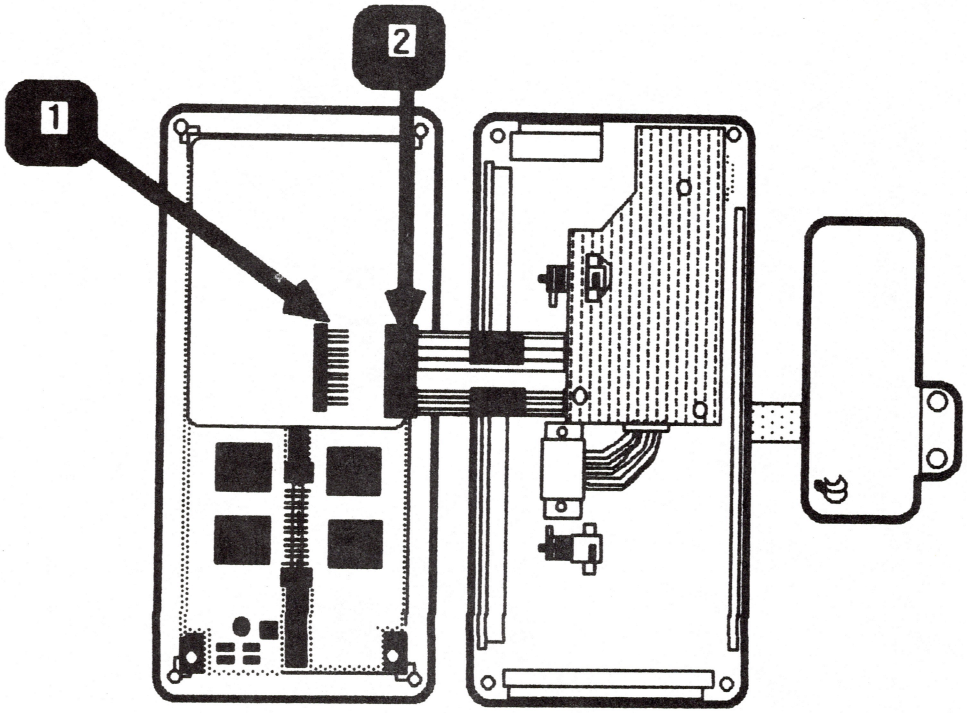

FIGURE 5

Install (LCD)

1. Place the both halves of the Flat Panel Display case on a protective foam pad, and orient them as shown in Figure 4.

   NOTE: The Apple logo should be positioned as shown in Figure 4, #1.

2. Place the LCD in the front panel with the connector (Figure 5, #1) on the right half of the LCD (pins pointing to the right).

3. Press down on the LCD until it snaps into place on all sides.

4. Connect the contrast card connector (Figure 5, #2) to the LCD (Figure 5, #1).

5. Fold the LCD over and onto the back half of the Flat Panel Display.

6. Press the two halves together until all fours sides snap into place.

7. Replace the Phillips screws.

8. Use the Apple IIc Diagnostic Diskette (video test) to make sure that the Flat Panel Display is functioning properly.

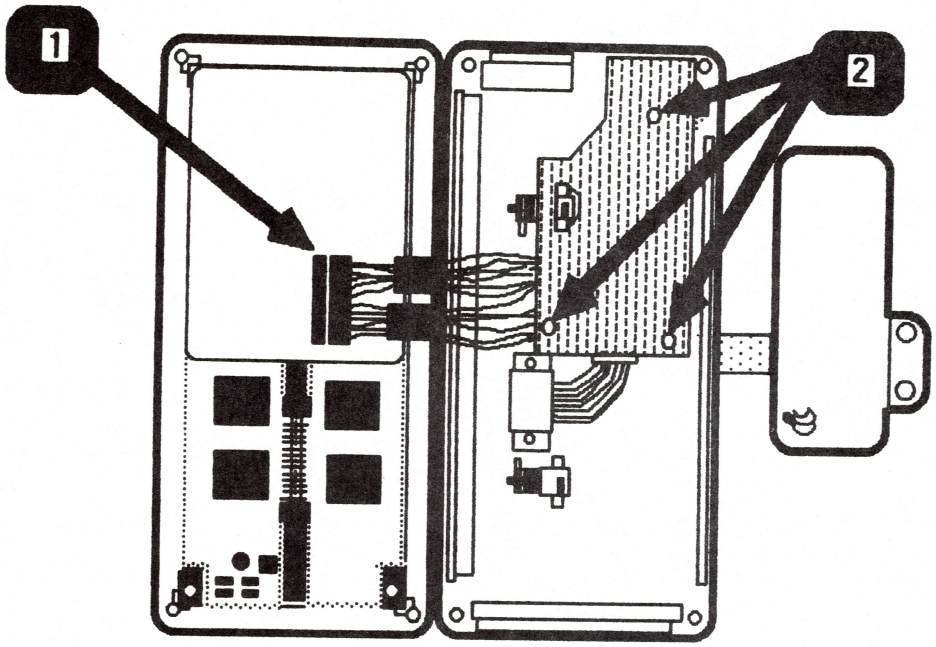

FIGURE 6

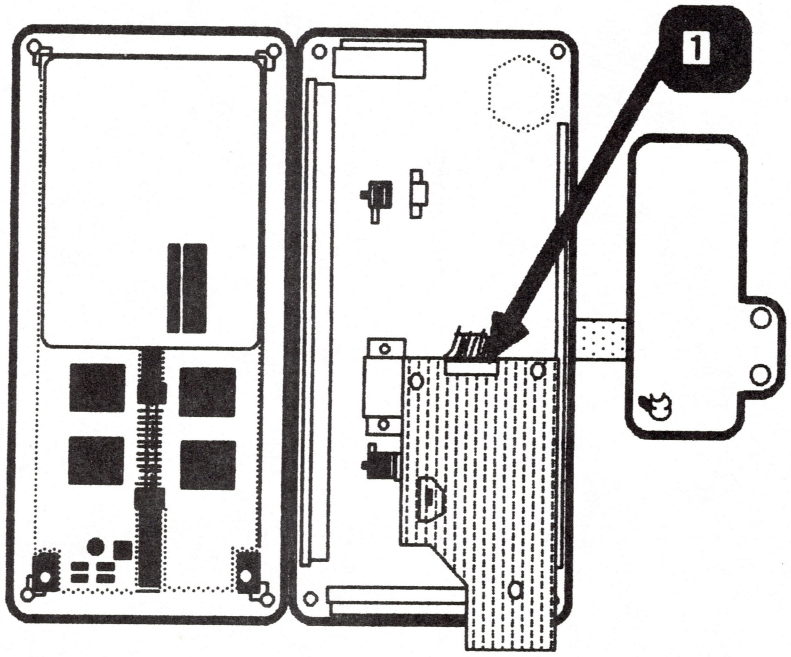

FIGURE 7

REMOVE AND INSTALL CONTRAST CARD

Removing the Contrast Card

1. Follow the steps listed under " Opening the Flat Panel Display Case").

2. Disconnect the contrast card connector (Figure 6, #1) from the LCD.

3. Remove the Phillips screws (Figure 6, #2) which secure the card to the case and lift the card out.

4. Flip the contrast card over so that you can easily access the ribbon cable connector (Figure 7, #1).

5. Disconnect the ribbon cable connector from the contrast card.

Installing the Contrast Card

1. Connect the ribbon cable (coming from connector box) to the contrast card with the solid side of the connector facing up. (See Figure 7, #1.)

2. Place the contrast card on the plastic support posts as shown in Figure 6.

3. Replace the Phillips screws (Figure 6, #2) to secure the card to rear panel.

4. Connect the LCD connector to the LCD. (See Figure 6, #1.)

5. Fold the LCD over and onto the back half of the Flat Panel Display.

6. Press the two halves together until all fours sides snap into place.

7. Replace the Phillips screws.

8. Use the Apple IIc Diagnostic Diskette (video test) to make sure the Flat Panel Display is functioning properly

REMOVE AND INSTALL INVERTER SWITCH COVER

Removing the Inverter Switch Cover

1. Follow the steps listed under "Remove the Contrast Card."

   NOTE: The inverter switch cover may stay with the contrast card as you remove it. If it is not on the card, it is inside the flat panel case.

2. Remove the inverter switch cover from inside the flat panel case or from the contrast card, whichever the case may be.

Installing the Inverter Switch Cover

1. Place the switch cover in the slot located at the upper left corner of the back case. There is only one way the switch cover will fit.

2. Follow the steps listed under "Replacing the Contrast Card".

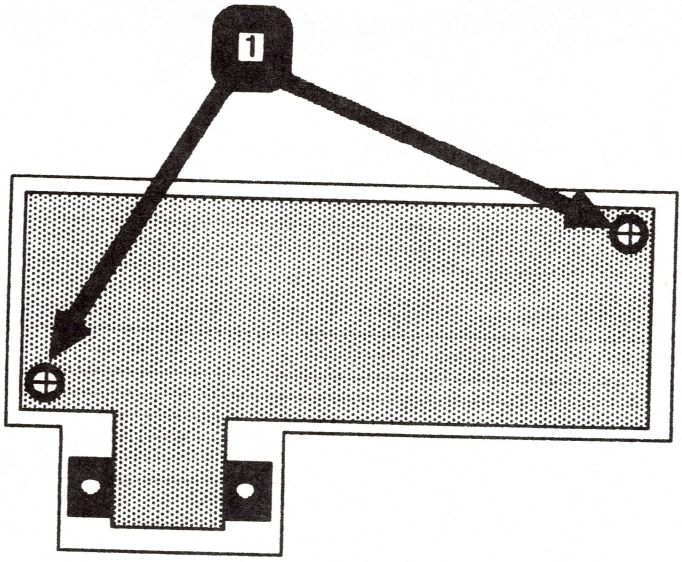

FIGURE 8

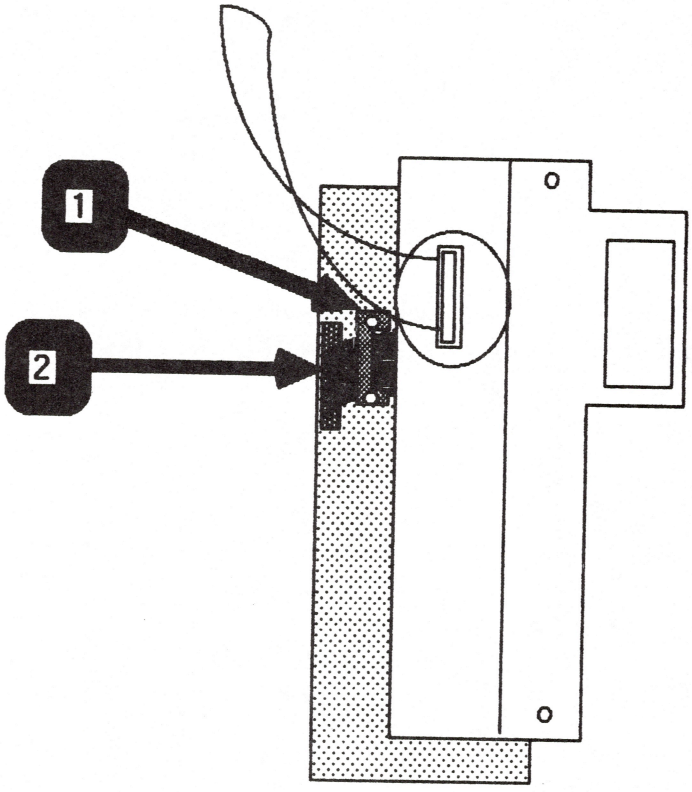

FIGURE 9

REMOVE AND INSTALL CONNECTOR BOX

Removing the Connector Box

1. Remove the two Phillips screws located at either side of the connector box case.

2. Carefully pry the case open.

3. Remove the two Phillips screws (Figure 8, #1) which secure the metal connector box to the case.

4. Push the DB-15 connector toward the inside of the plastic case until you can grasp the edges of the metal connector box.

5. Use a jeweler's Phillips screwdriver to remove the screws located at either side of the cable clamp (Figure 9, #1).

6. Disconnect the ribbon cable (Figure 9, #2) from the connector box, then lift the box completely out of the case.

Installing the Connector Box

1. Connect the ribbon cable to the socket at the bottom of the metal connector box. Push the connector down into the socket as far as it will go. (See Figure 9, #2.)

2. Replace the cable clamp as shown in Figure 9, #1.

3. Place the connector box inside the case so that the DB-15 connector protrudes through the opening at the bottom of the case.

4. Replace the screws (Figure 8, #1) to secure the connector box to its plastic case.

5. Place the rear panel on the case and press until it snaps into place.

6. Replace the Phillips screws on both sides of the case.

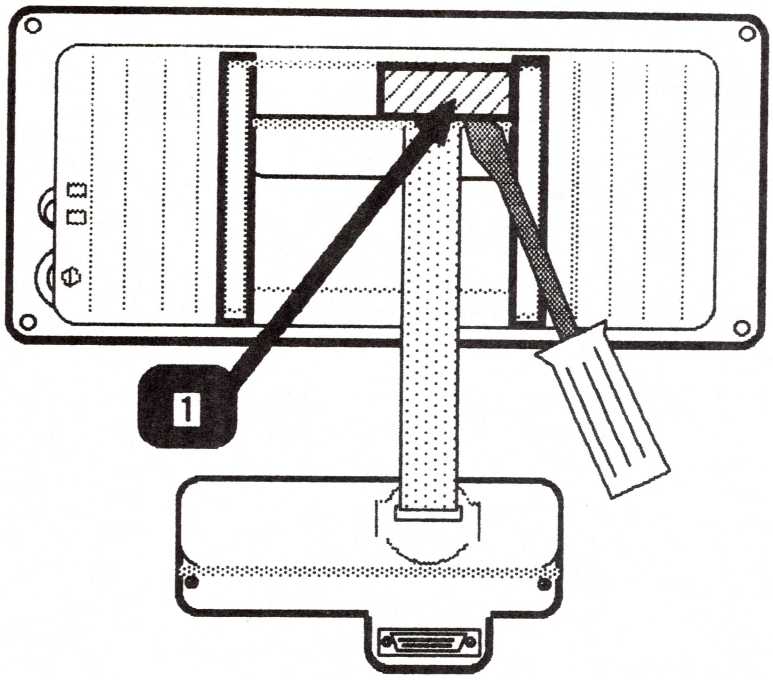

FIGURE 10

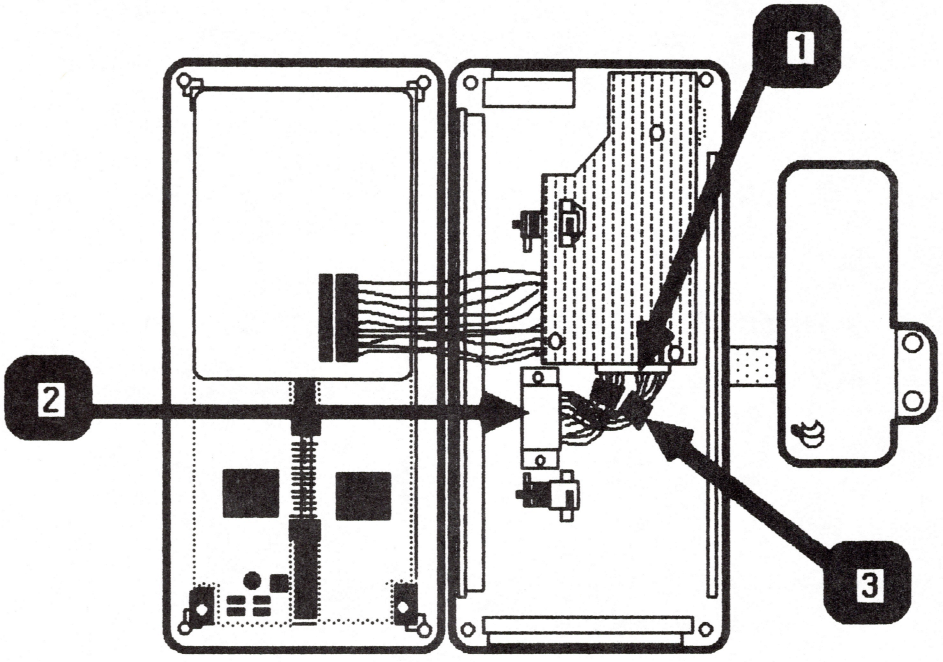

FIGURE 11

REMOVE AND INSTALL THE RIBBON CABLE

Removing the Ribbon Cable

1. Place the Flat Panel Display face down on a protective foam pad and orient it as shown in Figure 10.

2. Follow the steps listed under **"Opening the Flat Panel Display Case"**.

3. Disconnect the ribbon cable connector (Figure 11, #1) from the contrast card.

4. Remove the two Phillips screws which secure the ribbon cable clamp (Figure 11, #2) to the Flat Panel Display case. Lift the clamp off the plastic alignment posts.

5. Use a flatblade screwdriver to pry off the flat panel cable brace (Figure 10, #1).

IMPORTANT: IF THERE ARE TWO TOROID RINGS ON THE RIBBON CABLE AS SHOWN IN THE FIGURE 11, #3, CAREFULLY SQUEEZE THE RINGS (ONE AT A TIME) WITH A PAIR OF PLIERS UNTIL THE RINGS BREAK OFF THE CABLE.

6. Slide the cable out through the opening in the back case of the flat panel.

7. Follow the steps listed under **"Removing the Connector Box"**.

8. Slide the toroid ring (Figure 12, #1) over the connector box cable and set it aside.

9. Use a small flatblade screwdriver to pry the sides of the plastic cable brace (Figure 12, #2) until it is free from the case.

10. Slide the ribbon cable out (toward the inside of the case) through the opening in the connector box case.

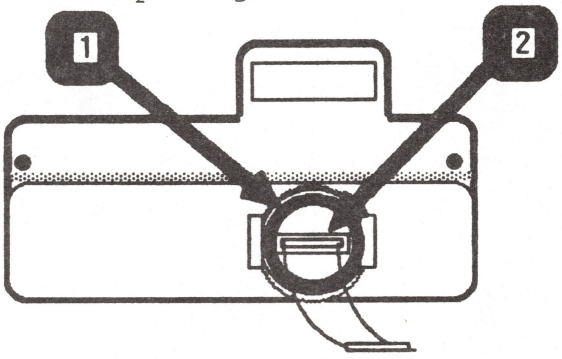

FIGURE 12

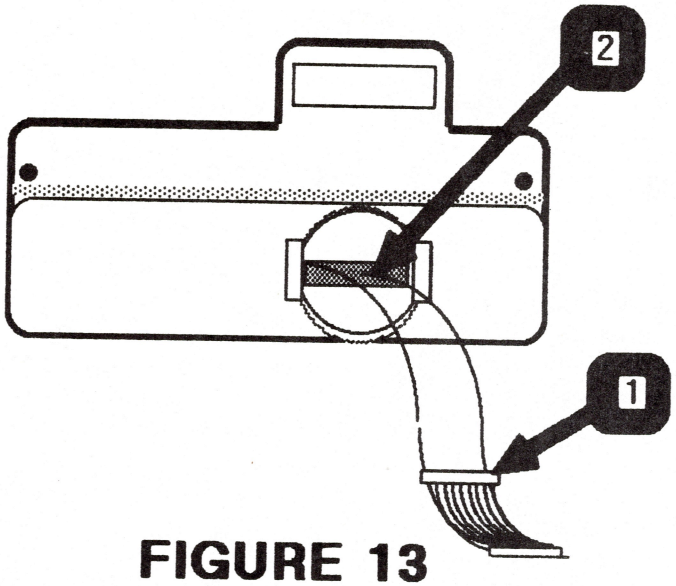

FIGURE 13

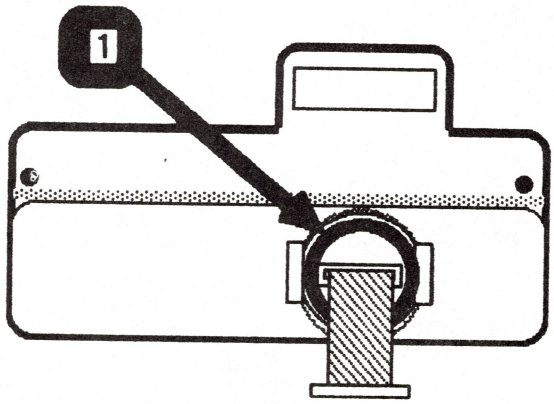

FIGURE 14

Installing the Ribbon Cable

1. Slip the end of the ribbon cable (without the plastic cable brace) through the opening on the inside of the connector box case. (See Figure 13.)

   Pull the cable through the connector box case until the plastic cable brace (Figure 13, #1) meets the slot (Figure 13, #2) on the inside of the case.

2. Push the plastic cable brace into its fitting (slot) until it is snug.

   NOTE: The back side of the plastic cable brace should protrude through the outside of the connector box case.

3. Slip the the toroid ring (Figure 14, #1) back over the ribbon cable.

4. Follow the steps listed under **"Installing the Connector Box".**

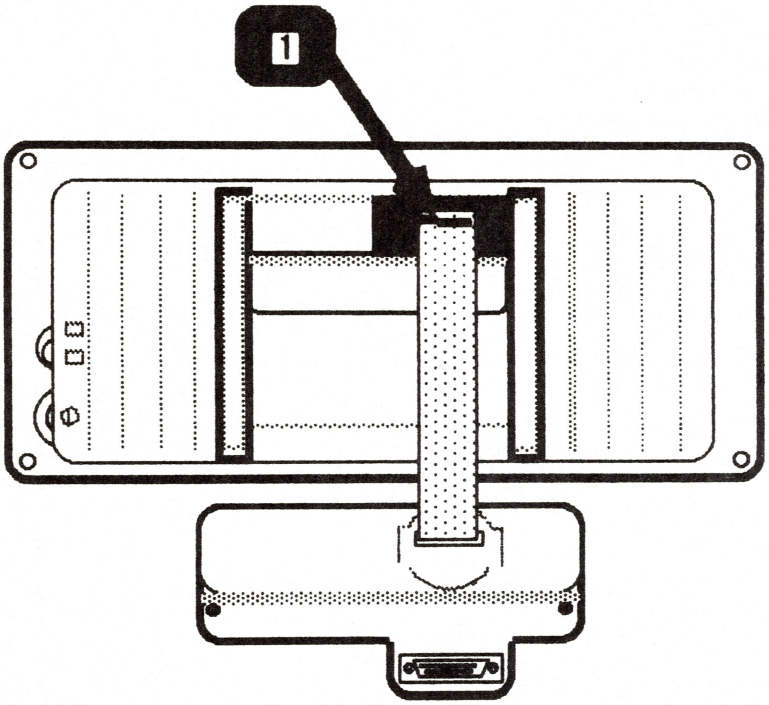

FIGURE 15

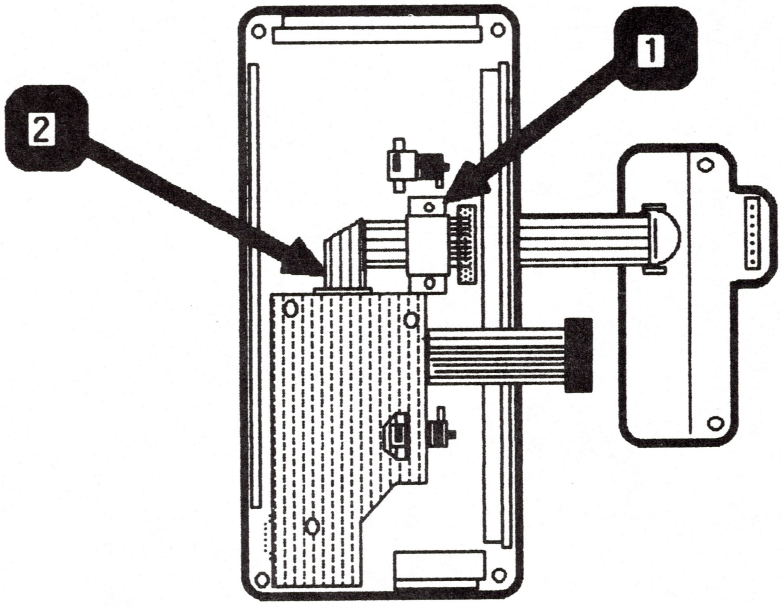

FIGURE 16

6. Orient the connector box and the back of the flat panel case as shown in Figure 15.

7. Slide the other end of the ribbon cable through the opening in the back of the flat panel case. Pull the cable through until the metal clamp on the insulation (white rubber coat) is just inside the opening in the case. (See Figure 15, #1.

   NOTE: The connector box should no more than 1/2 inch away from the flat panel.

8. Snap the plastic cable brace back into place on the back of the flat panel. (See Figure 10, #1.)

9. Flip the back side of the flat panel over and replace the metal cable clamp (Figure 16, #1).

10. Connect the ribbon cable to the contrast card as shown in Figure 16, #2.

11. Follow steps 4 through 8 of "**Installing the Liquid Crystal Display (LCD)**" to reconnect the LCD and close the flat panel display case.

Flat Panel Display Technical Procedures

Section 4

Illustrated Parts List

The figures and lists below include all piece parts that can be purchased separately from Apple for the Flat Panel Display, along with their part numbers. These are the only parts available from Apple. Refer to your Apple Service Programs manual for prices.

Contents:

Illustrated Parts List.....4.2

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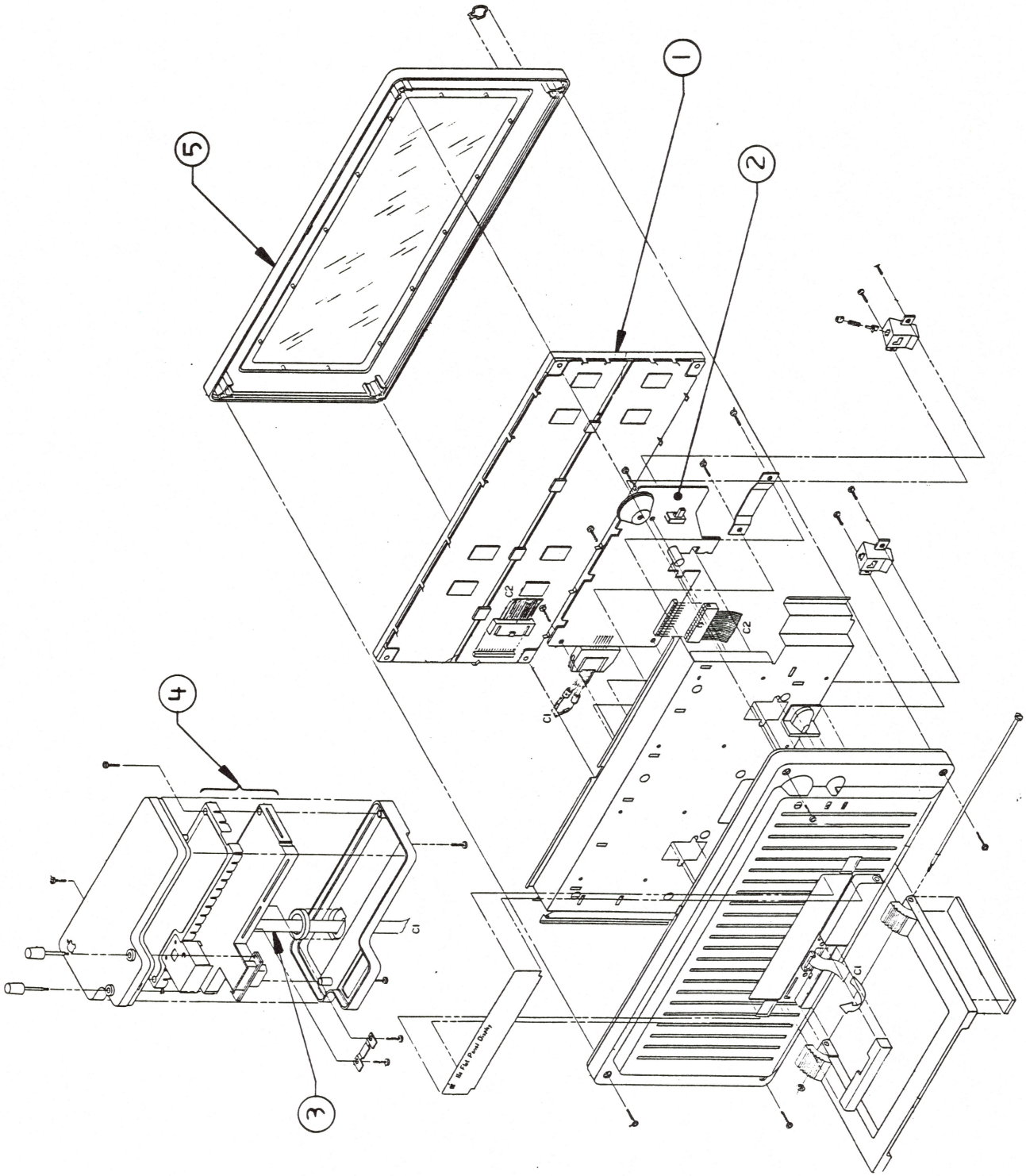

FLAT PANEL DISPLAY

Item	Part No.	Description
1	076-8128	Flat Panel Display, LCD
2	661-0281	Contrast Card, Flat Panel Display
3	936-0015	Cable, Assembly
4	661-0282	Connector Box, Flat Panel Display
5	815-0884	Case, Front FPD

Monitor llc

APPLE MONITOR IIc TECHNICAL PROCEDURES

TABLE OF CONTENTS

Section 1 - Technical Procedures

Serial Number Transfer.....1.1

Section 2 - Illustrated Parts List

Illustrated Parts List and Diagrams.....2.1

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APPLE MONITOR IIc TECHNICAL PROCEDURES

Section 1

Serial Number Transfer

Contents:

Serial Number Transfer.....1.2

NOTE: The Monitor IIc should be tested with the Apple II Peripherals Diskette. (See **Multi-Product Diagnostics Technical Procedures, Section 1.**)

SERIAL NUMBER TRANSFER

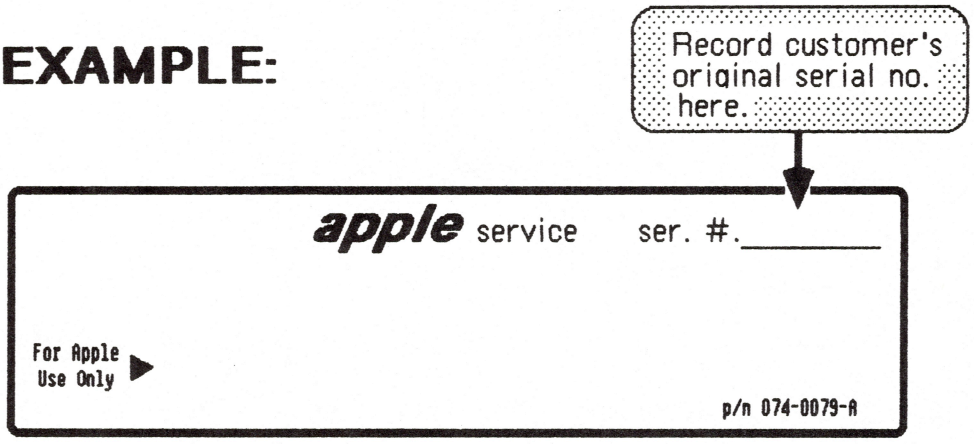
WHEN A CUSTOMER BRINGS IN A DEFECTIVE MONITOR IIc, HERE'S WHAT YOU DO TO REPLACE IT:

1. Record the serial number from the back of the customer's defective Monitor IIc.

2. Take a new Monitor IIc from your service stock. You will find a transparent label pasted over the original label on the back of the service stock monitor.

3. Use a medium point permanent marker to write in the customer's original serial number at the upper right hand corner of the transparent label. (See Example below.)

EXAMPLE:



NOTE: For the customer's records, the repair order paperwork should note the serial number exchange.

4. Give the customer the monitor from your service stock, and send the customer's defective monitor to Apple.

NOTE: The customer's power and video cables are not returned to Apple as part of the module exchange. Leave the cables with the customer.

Apple IIc Monitor Technical Procedures

Section 2

Illustrated Parts List

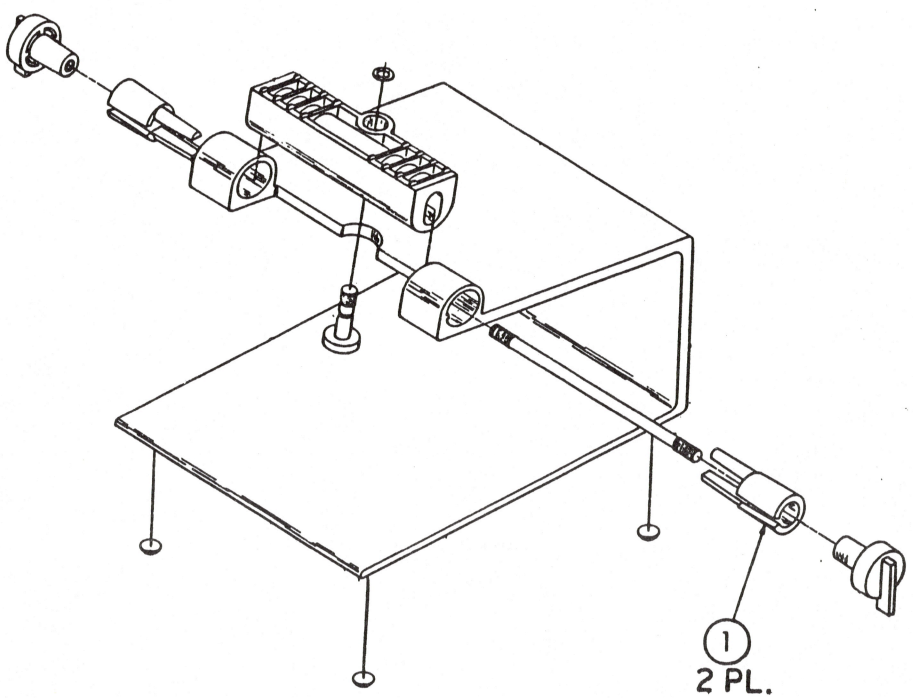
The figures and lists below include all piece parts that can be purchased separately from Apple for the Apple IIc Monitor, along with their part numbers. These are the only parts available from Apple. Refer to your Apple Service Programs manual for prices.

Contents:

Illustrated Parts List.....2.1

NOTE: UNLESS OTHERWISE SPECIFIED

REV.	ZONE	ECO #	REVISION	APP'D	DATE
A		S582	INITIAL RELEASE		



PARTS LIST HELD BY
APPLE SERVICE TRAINING

METRIC
DIMENSIONS ARE IN MILLIMETERS
TOLERANCES
.X ± —
.XX ± —
ANGLES ± —
(1/1 SCALE DRAWING)
MATERIAL: —
FINISH: —

DRFT Tom Angus	11/84	DRFT CK DH	11/84
ENG APPVL	11/84	MFG APPVL	
RELEASE E. Griffin	11/84	ORIG. DIV SERVICE	
DESIGNER		SCALE NONE	

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TITLE: ILLUS. PARTS LIST
MONITOR STAND
A//c

SIZE: B | DRAWING NUMBER: 070-0208-A | SHT 1/1

APPLE IIc MONITOR

Item	Part No.	Description
1	076-8117	Monitor IIc Stand Friction Cone, (12)

ColorMonitor IIe and IIc

APPLECOLOR COMPOSITE MONITOR IIe/IIc
and COLOR MONITOR IIe/IIc
TECHNICAL PROCEDURES

Except for case color, the AppleColor Composite Monitor IIe is identical to the ColorMonitor IIe, Series "H," and the AppleColor Composite Monitor IIc is identical to the ColorMonitor IIc, Series "S." In both cases, the procedures for the AppleColor Composite Monitor are the same as for the corresponding ColorMonitor.

APPLECOLOR COMPOSITE MONITOR IIe/IIc AND COLORMONITOR IIe/IIc TECHNICAL PROCEDURES

TABLE OF CONTENTS

Section 0 - Service Notes

Upgrade Procedure for Fuse F901 (to 4 Amp 125V).....0.5
LED Polarity Reversal Procedure - Series H.....0.9

Section 1 - Basics

Product Description.....1.3
Version Identification.....1.4
Safety Precautions.....1.5
Disposing of the Cathode-Ray Tube (CRT).....1.9

Section 2 - Troubleshooting

Introduction.....2.2
Troubleshooting Guide.....2.3

Section 3 - Take-Apart

Series "S"

Removing the Rear Cover (IIc only).....3S.3
Removing the Rear Cover (IIe only).....3S.5
Discharging the Cathode Ray Tube (CRT).....3S.7
Removing and Replacing Procedures:
Main Logic PCB.....3S.9
Power Supply/Panel/AC Cord Assembly.....3S.17
Cathode Ray Tube (CRT).....3S.19
Control PCB.....3S.21
White Only Switch.....3S.23
On/Off Switch (IIc only).....3S.25
On/Off Switch (IIe only).....3S.27
Power Supply Fuse (F871).....3S.29
Replacing the Rear Cover (IIc only).....3S.31
Replacing the Rear Cover (IIe only).....3S.33

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Section 3 - Take-Apart (CONTINUED)

Series "H"

Removing the Rear Cover (for IIc).....3H.3
Removing the Rear Cover (for IIe).....3H.5
Discharging the Cathode Ray Tube (CRT).....3H.7
Removing and Replacing Procedures:
Main Logic PCB.....3H.9
Cathode Ray Tube (CRT).....3H.21
LED Assembly (for IIc).....3H.25
LED Assembly (for IIe).....3H.27
Logic Board Fuses (F901 and F902).....3H.29
Replacing the Rear Cover (for IIc).....3H.31
Replacing the Rear Cover (for IIe).....3H.33

Section 4 - Adjustments

Introduction.....4.3
Text (Black & White) Adjustments.....4.5
Color Adjustments
Materials Needed.....4.7
Adjustment Procedure Series "S".....4.7
Adjustment Procedure Series "H".....4.11

Section 5 - Illustrated Parts List

IIe Monitors
Colormonitor IIe, Series "S".....5.3
AppleColor Composite Monitor IIe
and Colormonitor IIe, Series "H"..... 5.5
IIc Monitors
AppleColor Composite Monitor IIc
and Colormonitor II, Series "S"..... 5.7
Colormonitor IIc, Series "H"..... 5.9
ColorMonitor IIe/IIc, Series "H"
Packaging.....5.11

Apple ColorMonitor IIe/IIc
Technical Procedures

Section 0

Service Notes

Contents:

Upgrade Procedure for Fuse F901 (to 4 Amp 125V).....0.5
LED Polarity Reversal Procedure - Series H.....0.9

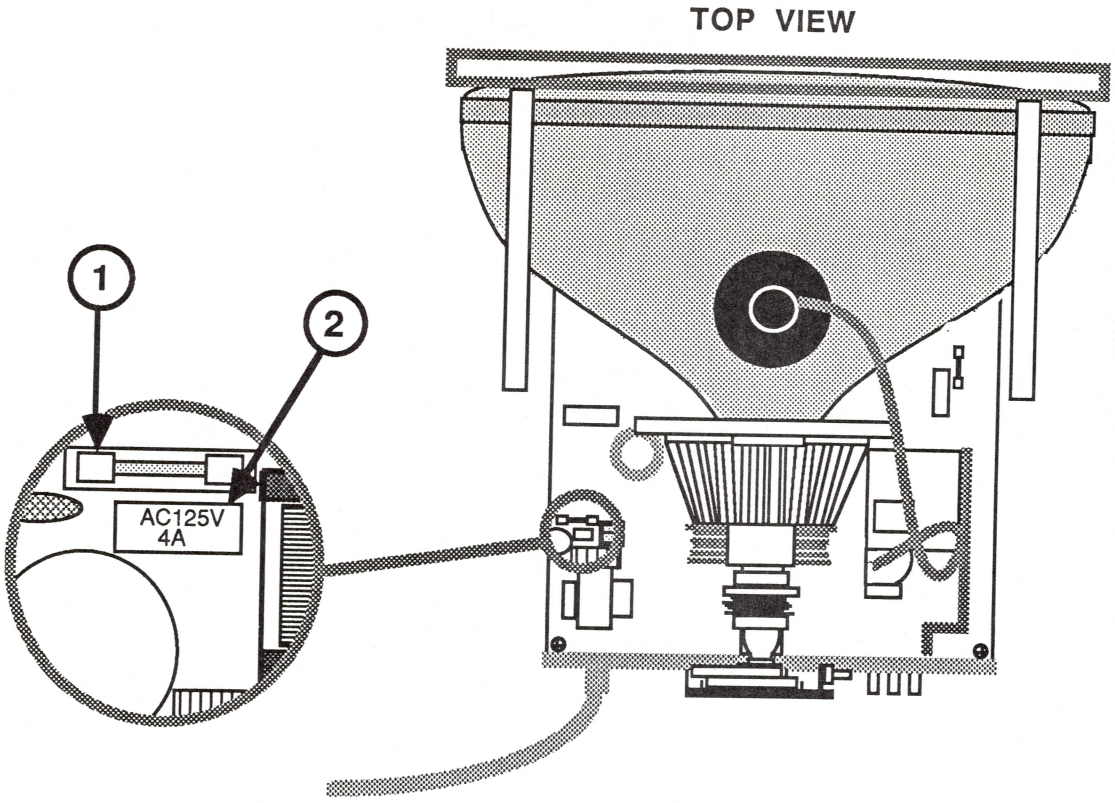


FIGURE 1

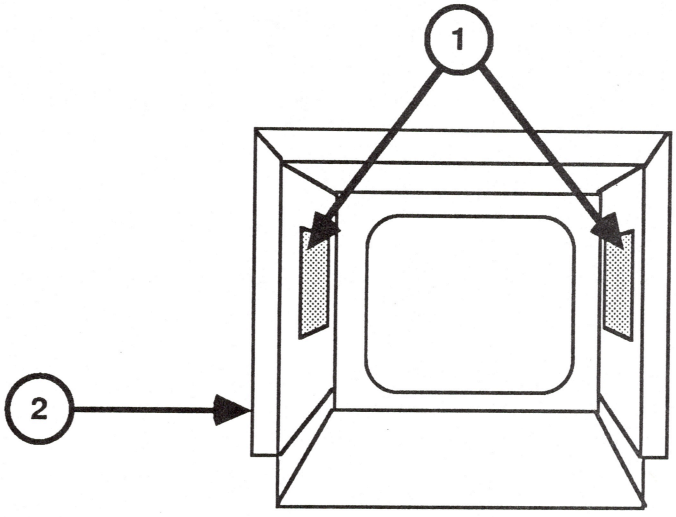


FIGURE 2

UPGRADE PROCEDURE FOR FUSE F901 (to 4 Amp 125V) - Series H

SERVICE NOTE: After extensive testing, the 3.15 Amp 250V fuse (F901) in the ColorMonitor IIe/IIc (Series H) has been shown to have a 1% failure rate. All 3.15 Amp fuses must be replaced with 4 Amp 125V fuses when they fail, or when any type of monitor problem occurs (for instance, when CRT is replaced). Also, you should replace any 3.15 Amp fuse that is currently in your Miscellaneous Hardware Kit with a new 4 Amp 125V fuse.

The Fuse Kit for the ColorMonitor IIe/IIc includes:

The correct 4 Amp 125 V medium blow fuse
Two large labels (in English and French)
for the inside of the monitor case
One small label for the logic board
Installation instructions

IMPORTANT: If you have not completed steps 1 through 4 of "Replacing the Logic Board Fuses (F901 and F902) - Series H" (in **Section 3, Take-Apart**), you must do so now before beginning this procedure.

1. Replace fuse F901 (Figure 1, #1) with the new 4 Amp 125V fast blow fuse.

2. Attach the small label (Figure 1, #2) below the fuse holder (F901).

3. Attach the two large labels (Figure 2, #1) over the existing labels to the inside wall of the ColorMonitor rear cover (Figure 2, #2).

   NOTE: The label on the left side is written in French and the one on the right in English. Be sure to attach each label to its proper position.

4. Carefully set the monitor on its face on a protective pad.

CONTINUE ON NEXT PAGE

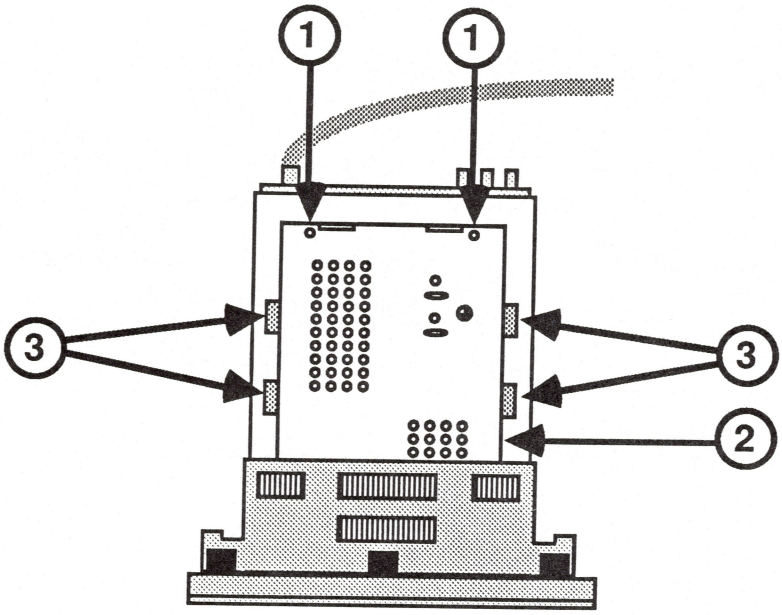


FIGURE 3

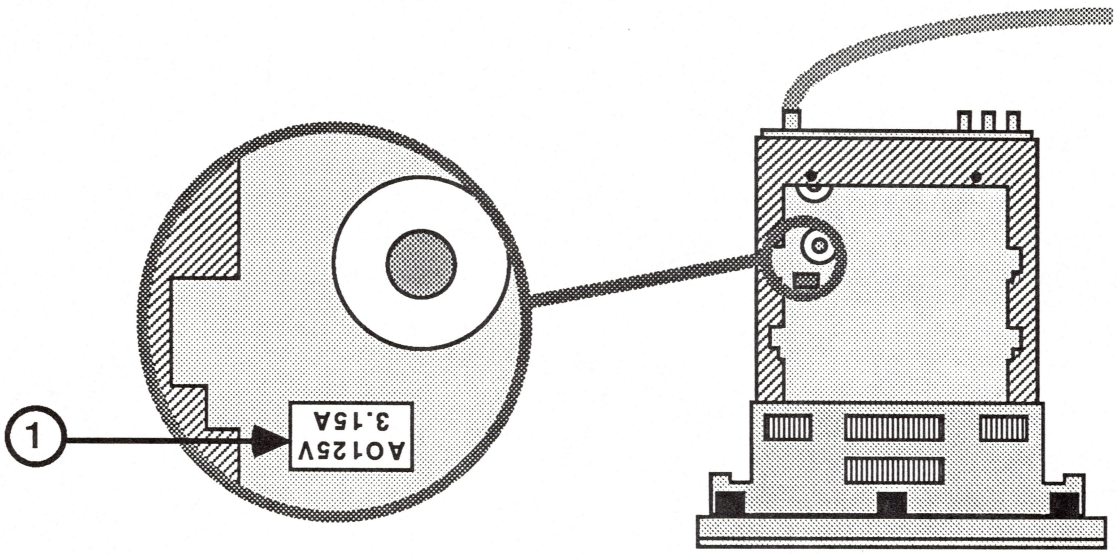


FIGURE 4

5. Remove the two screws (Figure 3, #1) that secure the bottom panel of the main logic PCB.

6. Remove the bottom panel (Figure 3, #2) from the main logic PCB.

7. Use a dark colored felt pen to blacken out the fuse information (Figure 4, #1) on the main logic PCB.

8. Replace the bottom panel and secure the two screws (Figure 3, #1) to the main logic PCB. Make sure that the four metal teeth (Figure 3, #3) are aligned before tightening the screws.

9. Replace the rear cover. (See "Replacing the Rear Cover" in **Section 3, Take-Apart.**)

10. Connect the AC power cord.

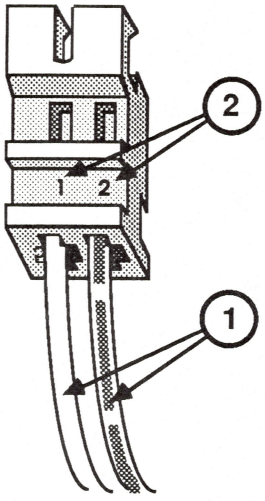


FIGURE 5

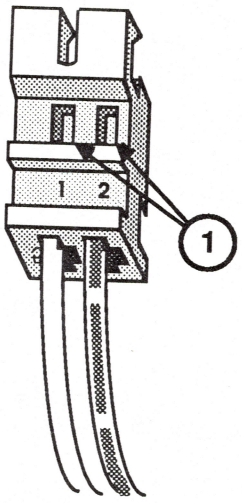


FIGURE 6

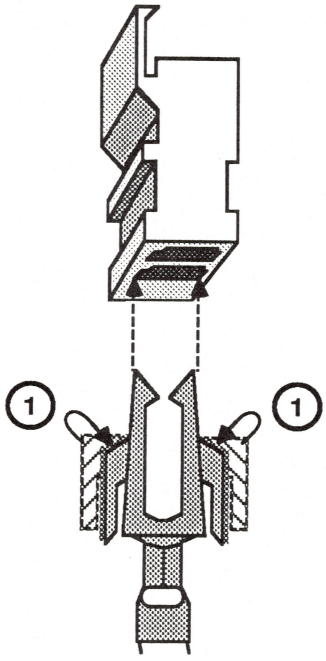


FIGURE 7

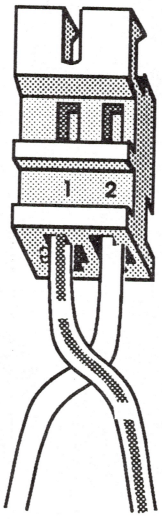


FIGURE 8

LED POLARITY REVERSAL PROCEDURE - SERIES H

On the ColorMonitor IIe, Series H, the polarity of the LED circuitry on the Rev. B logic board is reversed from that of the Rev. A. If you have made a logic board replacement and find that the LED does not work, follow the procedure below.

1. Remove the cover and discharge the CRT. (See **Section 3, Take-Apart.**)

2. Disconnect the LED connector from the logic board (for Rev. B) or from the small, vertically mounted video PCB attached to the logic board (for Rev. A). (For position of connector on board, refer to "Removing the Main Logic PCB - Series H" in **Section 3, Take-Apart.**)

   NOTE: The LED does **not** have to be removed from the bezel for this procedure.

3. The LED leads are color-coded (Figure 5, #1). Note which color is in which numbered side (Figure 5, #2).

4. Using the tip of a screwdriver, press in on the two small holes on each side of the connector (Figure 6, #1) to compress the metal lead tabs inside.

5. Pull the lead tabs out of the connector (Figure 7).

6. Straighten out the little metal teeth on the edges of the tabs where they were bent by the screwdriver tip (Figure 7, #1). These teeth must be separated enough from the tabs to snap back onto the connector holes on reinsertion.

7. Reverse the position of the leads and replace them in the connectors according to the orientation shown by the dotted lines in Figure 7. Push the leads in until the teeth snap into the connector holes (Figure 8). Tug on the leads to make sure they are seated securely.

8. Reconnect the LED connector to the logic board (Rev. B) or small video PCB (Rev. A). (Refer to "Replacing the Main Logic PCB - Series H" in **Section 3, Take-Apart.**)

9. Replace the cover. (See **Section 3, Take-Apart.**)

10. Power on the monitor to make sure the LED lights. If it does not, replace the LED.

Apple ColorMonitor IIe/IIc
Technical Procedures

Section 1

Basics

Contents:

Product Description.....1.3
Version Identification.....1.4
Safety Precautions.....1.5
Disposing of the Cathode-Ray Tube [CRT].....1.9

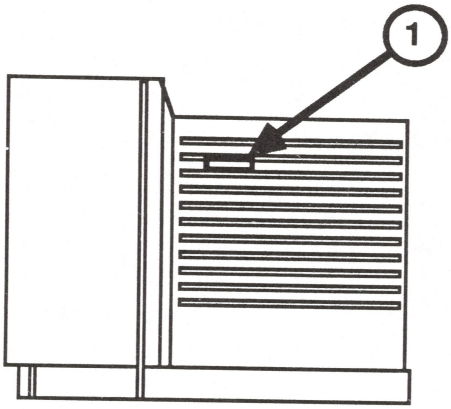


FIGURE 1

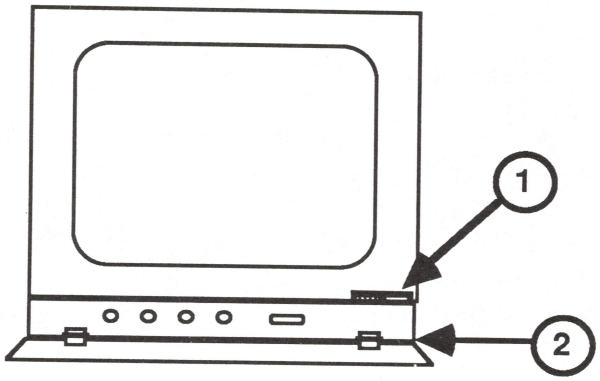


FIGURE 2

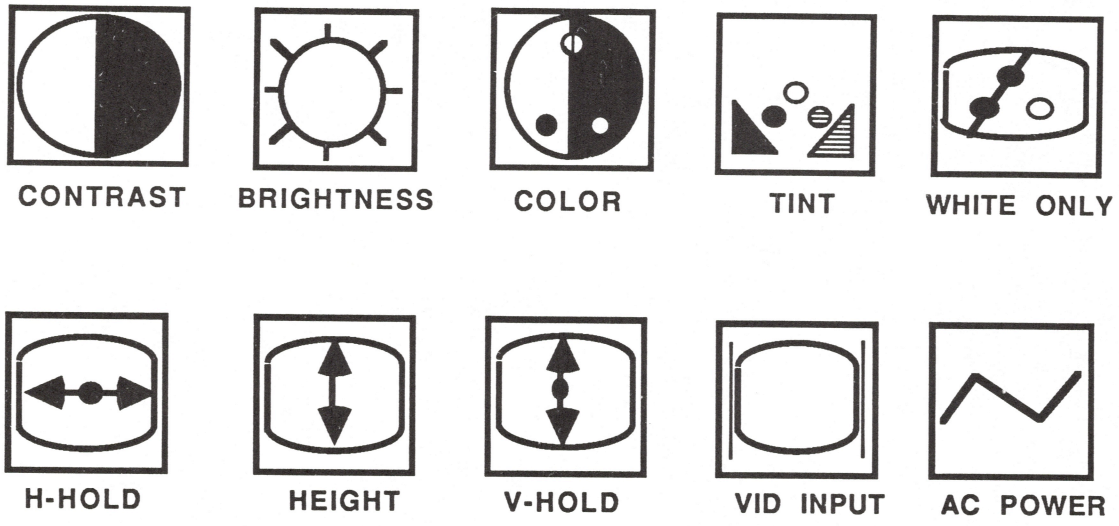


FIGURE 3

PRODUCT DESCRIPTION

The AppleColor Composite Monitor IIe/IIc (formerly called the ColorMonitor IIe/IIc) is a 14-inch display monitor operated with a composite video input signal. This means that it uses a standard RCA phono jack to connect the monitor input to the computer's video output jack. The power switch for the IIc version is on the top right side of the case (as you face the screen). It will stay depressed when the unit is on (Figure 1, #1). The power switch for the IIe version is at the front of the monitor on the lower right side (Figure 2, #1).

For both the IIe and the IIc versions of the monitor, frequently used controls are located behind a protective door (Figure 2, #2) on the bottom front of the monitor. Less frequently used controls are on the back of the monitor. Internationally recognized symbols, shown in Figure 3, are used to identify the various controls.

VERSION IDENTIFICATION

Two vendors supplied Apple with the ColorMonitor IIe/IIc. The two vendors' interior designs are referred to "Series S" and "Series H." Both vendors manufactured both case versions: the IIe case version in beige and the IIc case version in white. So, originally, we had four versions:

ColorMonitor IIe, Series S (beige)
ColorMonitor IIc, Series S (white)

ColorMonitor IIe, Series H (beige)
ColorMonitor IIc, Series H (white)

When the case color for both the IIe and the IIc was changed to platinum, the name was changed also -- to the AppleColor Composite Monitor IIe/IIc. At the same time, the production of new monitors was segmented by vendor so that the new AppleColor Composite Monitor IIc appears only in the Series S design, and the new AppleColor Composite Monitor IIe appears only in the Series H design. So, to the original four above, we add:

AppleColor Composite Monitor IIc, Series S only (platinum)
AppleColor Composite Monitor IIe, Series H only (platinum)

Finally, there are two versions (Rev. A and Rev. B) of the Series H logic board (both in finished goods monitors and in service modules). The major differences between the two revisions are given below:

Rev. A	**Rev. B**
Rear panel/AC power cord assembly detaches from logic board (two separate modules)	Power cord soldered to logic board (one module)
Separate power supply board	Logic board design includes power supply and video functions
Separate video board	
Isolation transformer on AC power circuit	**NO ISOLATION TRANSFORMER: DANGEROUS IF PLUGGED IN BACKWARDS!**

SAFETY PRECAUTIONS

The AppleColor Composite Monitor IIe/IIc (ColorMonitor IIe/IIc) is harmless as long as you're just watching the display. Removing the cover, however, exposes you to the high-voltage Cathode-Ray Tube (CRT)--the picture tube. The following precautions must be taken to ensure your safety, especially when you are performing live adjustments on the monitor.

Safe Electrical Setup

1. **Be sure your outlet is correctly wired and properly grounded.**

   Polarity and ground testers are available from most electronics stores. Test all outlets in your service area before working on **any** electrical equipment. If you have any doubts about your building's wiring, consult a qualified electrician.

2. **Never use an adaptor plug to connect a monitor's three-prong power plug to a two-prong wall outlet.**

   Adaptors defeat the ground pin, which is a safety feature.

3. **Use an isolation transformer between the monitor and the outlet when performing live adjustments.**

   Order an isolation transformer from your electronics distributor, and make it a practice to use it whenever you are working with **any** charged monitor or other powered system under test. An isolation transformer isolates the circuitry of the system under test from the power company's circuitry, reducing the likelihood of a fatal shock should you simultaneously contact high voltage and anything else that is earth-grounded.

   Do not connect more equipment to the transformer than the wattage capacity of the transformer will bear. (It is usually best to connect only one piece of equipment at a time.) We recommend an isolation transformer with a minimum wattage capacity of 500 VA, with a grounded three-prong cord and receptacle. Two such transformers, available from many electronics stores and distributors, are listed below:

   Triad N-57M Stancor GIS 500

CRT Safety Rules

1. **Do not work on a monitor alone.**

   In case of accident, it could save your life to have someone else nearby. Apple recommends that your staff be trained in Cardio-Pulmonary Resuscitation (CPR).

2. **Remove rings, watches, bracelets, hanging necklaces, and other jewelry before performing repairs on a monitor.**

   Metal jewelry is an excellent conductor of electricity. Removing jewelry will reduce the possibility of electric shock.

3. **Never use a grounding wriststrap or heelstrap or work on a grounded workbench mat when discharging a monitor or when performing live adjustments.**

   Grounding wriststraps, heelstraps, and mats are used to protect sensitive components from the damaging effects of electrostatic discharge from your own body or clothing. Even though they contain a one-megohm resistor and are designed to conduct only small electrical charges, we recommend that they be used **only** when working on "dead" (uncharged) equipment.

4. **Wear safety goggles when working with a CRT.**

   The CRT contains a high vacuum. If cracked or broken, it can implode (collapse into itself, then explode). To protect your eyes from serious injury, always wear safety goggles when working on or near a CRT, and be careful of other people in the area.

5. **Before working inside a monitor, turn off the power and disconnect the AC power cord.**

   Certain parts of a monitor chassis are hot (electrified) when the monitor is under power. Except when you must have the power on (for example, when making live adjustments), never work on a plugged-in monitor--even if you have the power turned off.

6. **Keep one hand in your pocket or behind your back when working on a live monitor.**

   This practice reduces the risk of current passing through your heart, should you accidentally contact high voltage.

7. **Always discharge the anode before touching anything inside the monitor.**

   The anode of the CRT maintains a charge of about 24,000 volts DC (even when the power is off). Before touching any internal components you must discharge this voltage. The anode can regain some charge, even after it has been discharged. If the service procedure takes more than 30 minutes, the anode should be discharged again.

8. **Never touch the anode connector or the anode aperture.**

   Normally the anode aperture (Figure 4, #1) has a connector plugged into it (Figure 4, #2). When a CRT is replaced, the anode connector is removed, exposing the anode. The anode can maintain a charge of several thousand volts (even after the power is off).

9. **Do not pick up or handle a CRT by its neck.**

   To prevent an implosion, you should take every precaution against breaking the tube. Be especially careful with the neck, the area where the tube is the thinnest.

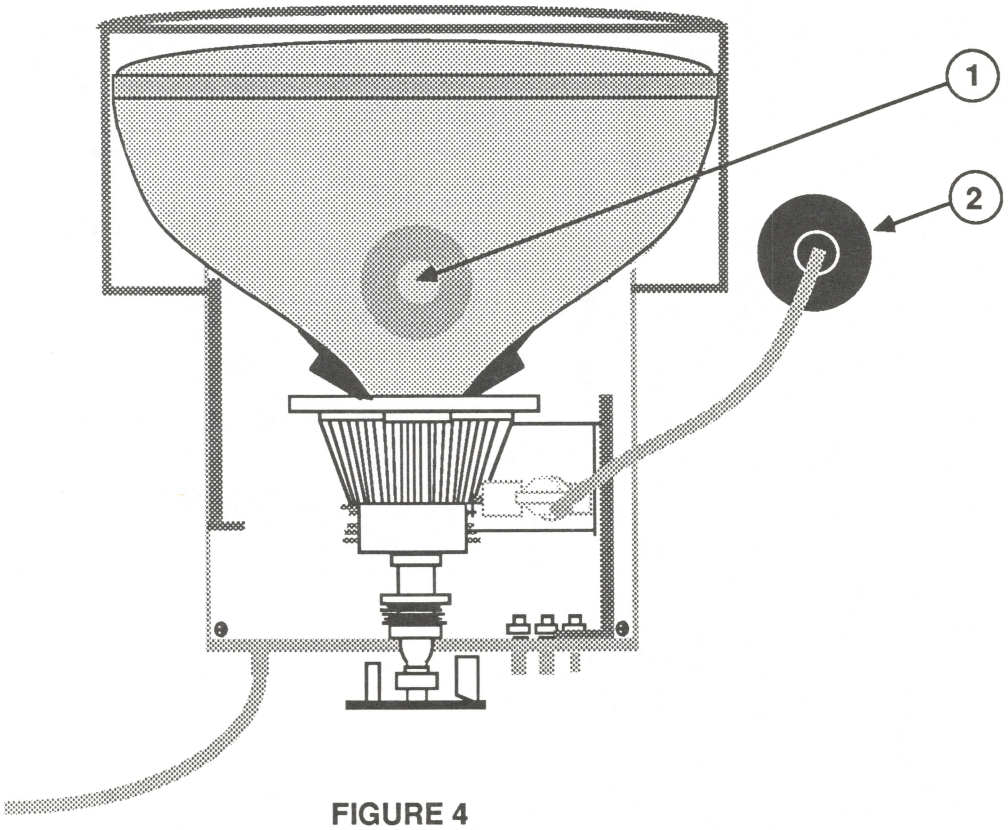


FIGURE 4

Live Adjustment Rules

In addition to the precautions listed on the previous pages, never touch the following components when adjusting a live AppleColor Composite Monitor IIe/IIc:

1. The yoke wires (Figure 5, #1)
2. The anode connector (Figure 5, #2)
3. The anode wire (Figure 5, #3)
4. The flyback transformer (Figure 5, #4)

WARNING: Serious injury could result if you touch any of these components with the power on.

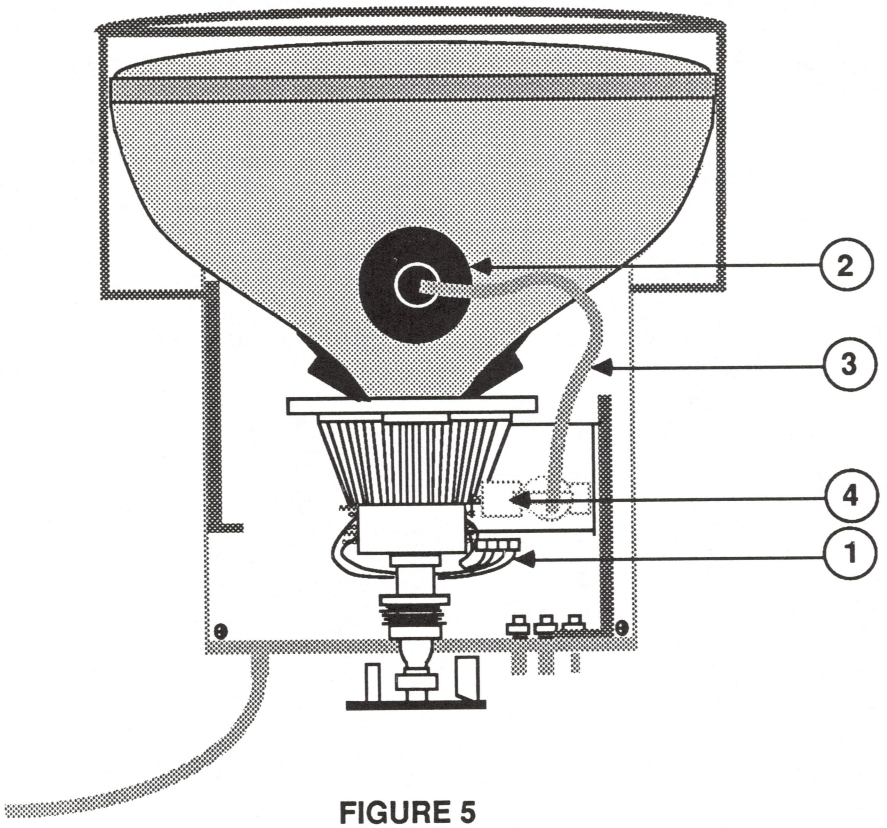


FIGURE 5

DISPOSING OF THE CATHODE-RAY TUBE (CRT)

WARNING: Remember that a CRT can implode unless it is devacuumed. Putting a defunct CRT into a trash receptacle without devacuuming it can endanger other people.

Materials Required

Thick cardboard box large enough to conceal the CRT
Large, sharp diagonal cutters
Large pliers
Duct tape
Safety goggles
Gardening gloves
12-inch square of cloth or heavy paper

Devacuuming the CRT

1. Put on the safety goggles.

2. In the side of the box about six inches from the bottom, cut or drill a hole just large enough to accommodate the very tip of the CRT.

3. Place the CRT inside the box with the tip of the neck protruding through the hole, and tape the box flaps down with duct tape (Figure 6).

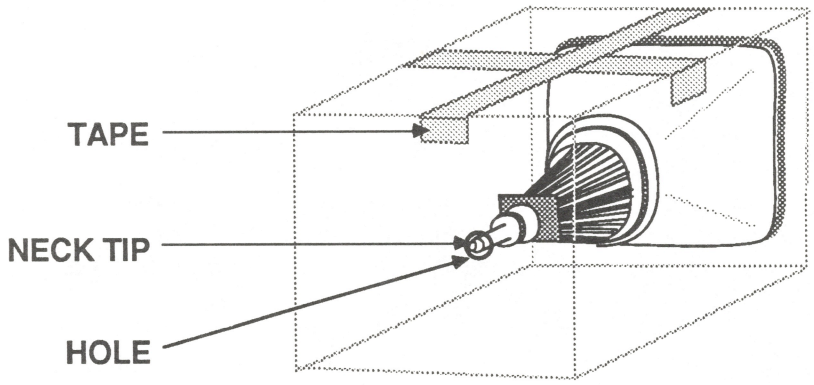


FIGURE 6

WARNING: Only the very tip of the CRT neck should be protruding through the hole in the box. The box must not have any other openings.

4. Put on the gloves.

5. Pull off the black plastic guide located at the end of the CRT neck. Using the diagonal cutters, carefully clip off the connector pins on the end of the CRT neck.

6. Tape the piece of cloth or paper onto the box (Figure 7, #1) so that it forms a veil over the opening (Figure 5, #2) but allows your hand access to the tip of the CRT. The veil's purpose is to catch the bits of glass that may fly during the following step.

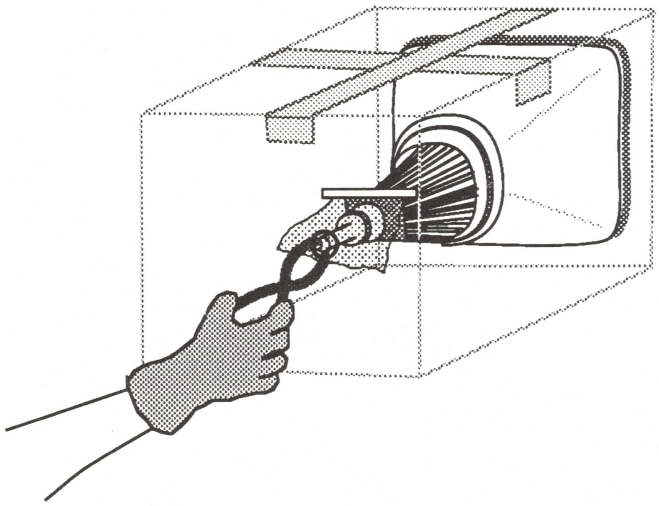


FIGURE 7

7. Make sure no one is standing nearby. Place the pliers under the veil, stand to one side, and look away while you use the pliers to snip off the exposed tip of the CRT.

   WARNING: Do not look directly at the box when cutting off the tip!

   You will probably hear a rush of air entering the CRT when the CRT vacuum breaks--but even if you don't, the procedure is complete if the inner space of the CRT is clearly visible through the opening created by the removed tip.

Apple ColorMonitor IIe/IIc
Technical Procedures

Section 2

Troubleshooting

Introduction.....2.2
Troubleshooting Guide.....2.3

INTRODUCTION

This troubleshooting section consists of a symptom chart showing each symptom and a list of fixes.

DO THIS FIRST: There are two series of ColorMonitor IIe/IIc. Use the following criteria to identify the series of ColorMonitor IIe/IIc that you are troubleshooting:

* **Series "S"** monitors have two plastic hinges with metal pins on the lower front door of the monitor.

* **Series "H"** monitors have three entirely plastic hinges which bend along a preset crease.

IMPORTANT TERMS: There are two parts to the display on a monitor:

Video - The information (characters, graphics, etc.) on the display. The video is usually displayed over the raster (described below) so that the raster is not visible.

Raster - The lit portion of the screen which is usually covered by video so that it is not visible. When the raster is displayed by itself with no video, it looks like a blank white box.

DIRECTIONS:

* In the table beginning on the opposite page, find the symptom which most closely resembles that exhibited by the defective monitor. Then try the recommended action(s) in the order listed.

* If a recommended action specifies **Series "S"** or **Series "H,"** perform it only if your monitor is of that series (refer to DO THIS FIRST above for more information).

* If neither **Series "S"** nor **Series "H"** is specified, the recommended action is applicable to both.

* If the problem still exists after trying the actions listed, contact your Regional Technical Support Center for assistance.

SYMPTOM	ACTION
NO RASTER	Adjust the external BRIGHTNESS control on front panel. **Series "S"** - Check fuse 871 on the power supply PCB; replace if blown. **Series "H"** - Check fuse 901 on the main logic board; replace if blown. Check that all connectors are secure on power supply and main logic PCBs. **Series "S"** - Replace power supply board. **Series "S"** - Replace rear panel/AC cord. Replace main logic PCB. Replace power switch. Replace CRT.
ONE HORIZONTAL LINE APPEARS	**Series "S"** - Check to make sure that the internal service switch (SW800) is in NORMAL position. Refer to Series "S" color adjustment procedure (in "Adjustments" section) for switch location. Check yoke connector. Replace main logic PCB. Replace CRT.
ONE VERTICAL LINE APPEARS	Check yoke connector. Replace main logic PCB. Replace CRT.
ONE SIDE OF THE RASTER IS A DIFFERENT HEIGHT THAN THE OTHER (keystone effect)	Replace CRT.

SYMPTOM	ACTION
ABNORMAL RASTER (other than above)	Check to make sure all connectors are correctly seated and in right places on the PCBs. Replace main logic PCB.
HORIZONTAL LINEARITY BAD	Replace main logic PCB.
MONITOR MAKES HIGH PITCHED NOISE	Replace main logic PCB. **Series "S"** - Replace power supply board.
RASTER IS SMALL AND ABNORMALLY BRIGHT	Check yoke connector. Replace main logic PCB. Replace the CRT.
NO VERTICAL SYNCHRONIZATION	Set external VERTICAL HOLD control on back panel. Replace main logic PCB.
RASTER NOT CENTERED	Replace main logic PCB.
CAN'T ADJUST COLOR, CONTRAST, BRIGHTNESS, ETC.	Replace main logic PCB.
CHARACTERS JITTER	Make sure all ground straps are secure. Verify adjacent computer equipment is properly grounded. **Series "S"** - Replace power supply PCB. Replace main logic PCB.
VERTICAL LINEARITY BAD	Replace main logic PCB.
BLACK SPOT REMAINS WHEN UNIT IS OFF (burnt phosphor)	Replace CRT.

SYMPTOM	ACTION
PICTURE TOO DARK OR TOO BRIGHT	Adjust external BRIGHTNESS control (on front panel). **Series "S"** - Adjust internal SUB-BRIGHTNESS control. Refer to Series "S" color adjustment procedure (in "Adjustments" section) for location. Replace main logic PCB.
OUT OF FOCUS	Replace main logic PCB. Replace CRT.
RASTER IS ONE PREDOMINANT COLOR	See color adjustment procedure (in "Adjustments" section). Replace main logic PCB.
NO COLOR	Make sure that software is supposed to display in color. Make sure WHITE ONLY switch is in "out" position. Replace main logic PCB.
INCORRECT COLORS	If colors are very seriously out of adjustment, adjust internal color controls (see "Adjustments" section).
MONITOR TURNS ITSELF OFF	Replace main logic PCB.
FLASHING OR WAVY SCREEN	Gently crimp the metal connector tabs on the video connector.

Apple ColorMonitor IIe/IIc
Technical Procedures

Section 3

Take-Apart

Series "S"

Contents:

Removing the Rear Cover (for IIc).....3S.3
Removing the Rear Cover (for IIe).....3S.5
Discharging the Cathode Ray Tube (CRT).....3S.7
Removing and Replacing Procedures:
  Main Logic PCB.....3S.9
  Power Supply/Panel/AC Cord Assembly.....3S.17
  Cathode Ray Tube (CRT).....3S.19
  Control PCB.....3S.21
  White Only Switch.....3S.23
  On/Off Switch (for IIc).....3S.25
  On/Off Switch (for IIe).....3S.27
  Power Supply Fuse (F871).....3S.29
Replacing the Rear Cover (for IIc).....3S.31
Replacing the Rear Cover (for IIe).....3S.33

NOTE: For Series "H" Take-Apart, see the next section, beginning on page 3H.1.

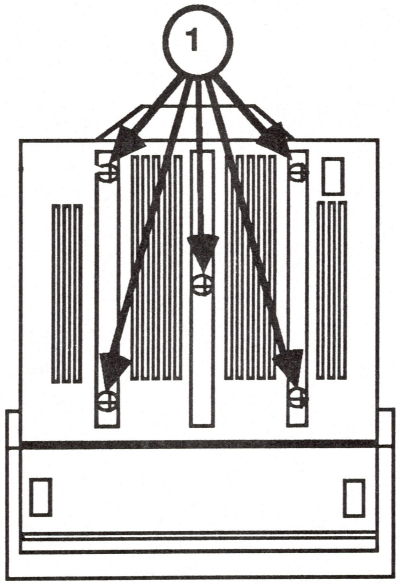


FIGURE 1

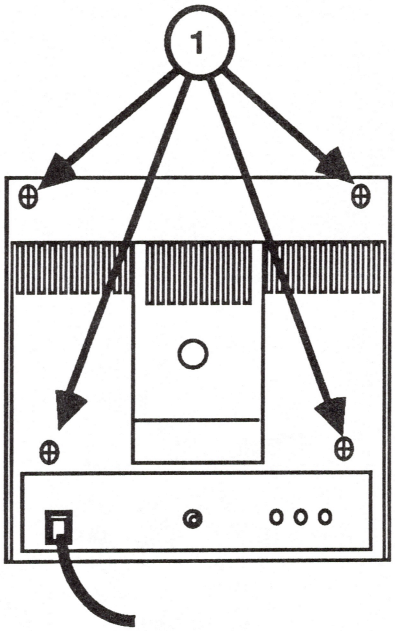
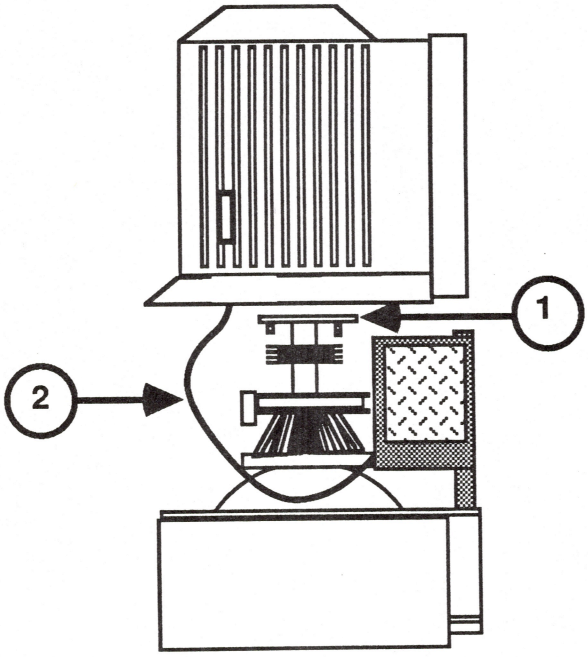


FIGURE 2



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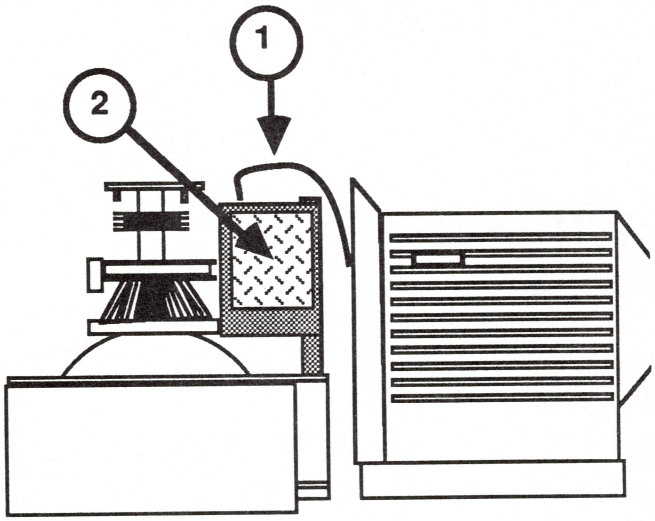


FIGURE 4

REMOVING THE REAR COVER (IIc ColorMonitor only) - Series "S"

1. Turn the monitor off and disconnect the power cord.

2. Disconnect the video cable from the back of the monitor.

3. Carefully set the monitor on its face (screen side) so that the back is facing up. (**NOTE:** The ColorMonitor contains sensitive components that can be damaged by rough treatment. Whenever it is necessary to turn the monitor over, be sure to rest it on a protective pad.)

4. Remove the five screws (Figure 1, #1) from the bottom of the monitor.

   NOTE: There may be antistatic rubber grommets covering the bottom case screws. If so, you will need to remove them (using a jeweler's screwdriver or needlenose pliers) before you can remove the screws.

5. Remove the four screws (Figure 2, #1) from the back of the monitor.

6. Carefully pull the rear cover up until it clears the CRT socket board (Figure 3, #1) at the end of the CRT neck.

   CAUTION: Because the power switch is attached to the rear cover, the cover cannot be completely removed until the switch cable (Figure 3, #2) is disconnected from the power supply board, as directed in Step 9 below.

7. Set the rear cover right next to the monitor as shown in Figure 4.

8. **DISCHARGE THE CRT.** (See "Discharging the Cathode Ray Tube [CRT]," in this section.)

9. Follow the power switch wire (Figure 4, #1) from the switch (inside the rear cover) to its connector on the power supply board. Disconnect the power switch connector from CN11 on the power supply board (Figure 4, #2).

   NOTE: The connectors (CN) are labeled on both sides of the power supply board.

10. Pull the AC power cord through the opening in the rear cover. Set the rear cover aside.

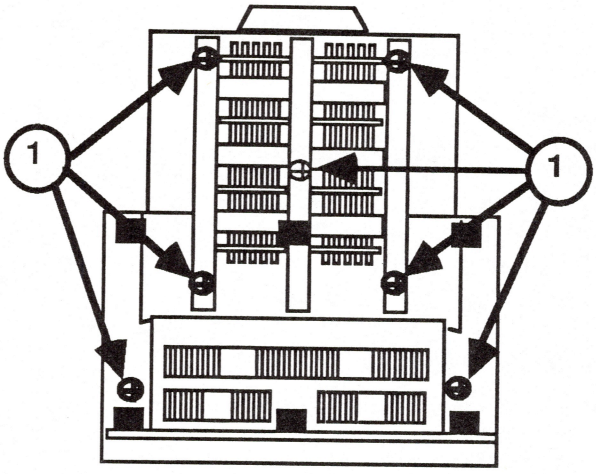


FIGURE 5

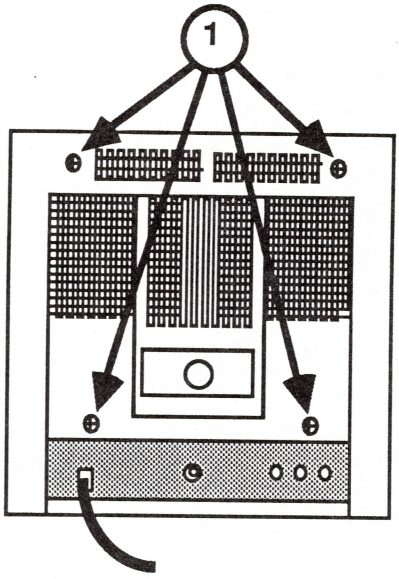


FIGURE 6

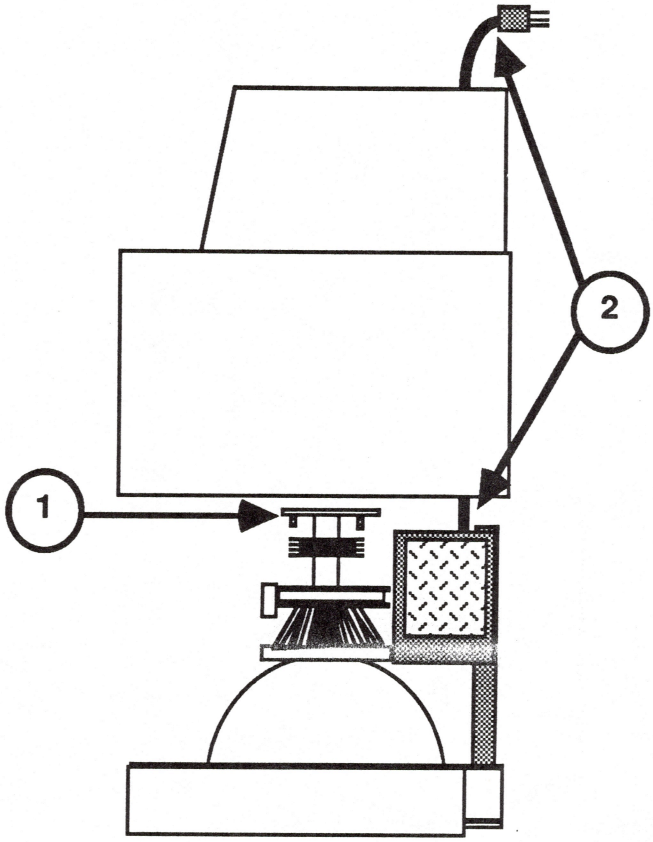


FIGURE 7

REMOVING THE REAR COVER (IIe ColorMonitor only) - Series "S"

1. Turn the monitor off and disconnect the AC cord.
2. Disconnect the video cable from the back of the monitor.
3. Carefully set the monitor on its face on a protective pad.
4. Remove the seven screws (Figure 5, #1) from the bottom of the monitor.
5. Remove the four screws (Figure 6, #1) from the back of the monitor.
6. Carefully pull the rear cover up until it clears the CRT socket board (Figure 7, #1).
7. Pull the AC power cord (Figure 7, #2) through the opening in the rear cover.
8. Set the rear cover aside.

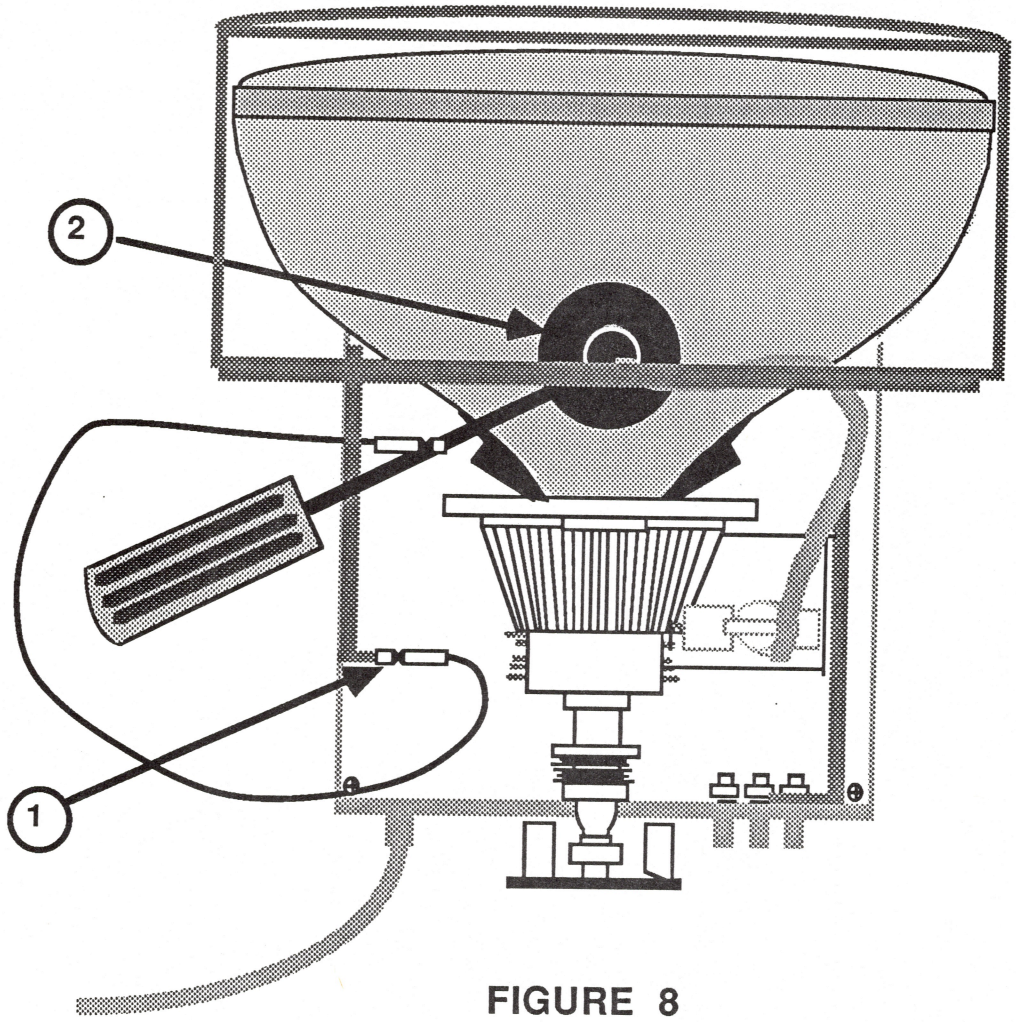


FIGURE 8

DISCHARGING THE CATHODE RAY TUBE [CRT] - Series "S"

1. Turn off the monitor and disconnect the AC power cord.

2. Remove the rear cover. ("See Removing the Rear Cover.")

3. Set the monitor upright, with the back facing you.

4. Remove any metal jewelry (rings, watches, bracelets, hanging necklaces, etc.) and grounding wriststraps.

5. Put on safety goggles.

6. Attach one end of an alligator lead to a long flatblade screwdriver, two inches from the insulated handle. Attach the other end to any part of the metal bracket surrounding the power supply board. (Figure 8, #1.)

   WARNING: USE ONLY ONE HAND WHILE DISCHARGING THE CRT. This is to eliminate any chance of your becoming a path for current should your hand slip and touch the metal part of the screwdriver. Grasp only the insulated handle of the screwdriver while discharging the CRT.

7. Slide the screwdriver under the CRT anode cap (Figure 8, #2) and push it towards the center of the cap until the blade contacts the metal anode ring.

   CAUTION: DO NOT USE FORCE. If it is difficult to get the screwdriver under the anode cap, use a smaller screwdriver to loosen the suction of the anode cap on the tube. Discharge the anode by holding the large screwdriver against the anode ring for five seconds.

8. Remove the screwdriver and disconnect it from the alligator clip.

9. Peel back the anode cap until you can see the anode ring at the center. Look at the metal connector in the center of the cap and notice how it is clipped into the CRT. Push on the cap in one direction, freeing the metal connector from the CRT, and lift the cap off the tube.

   NOTE: A secondary charge can build up even after you have discharged the CRT. To ensure that any residual charge is dissipated during the service procedure, establish a ground lead by fastening one alligator clip to the metal chassis and the other clip to the edge of the anode aperture.

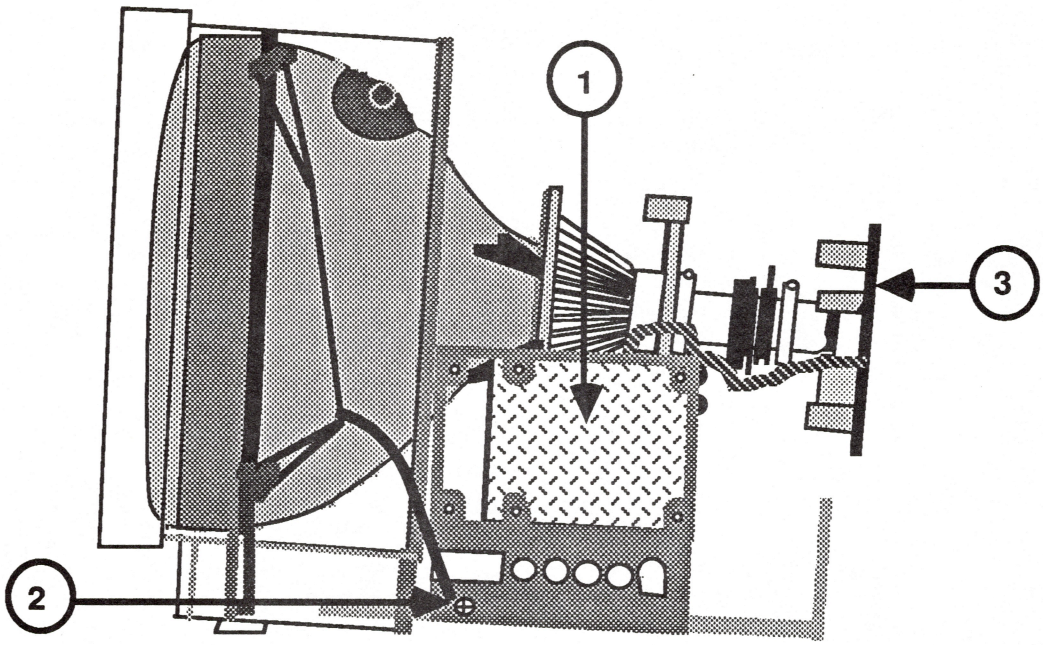


FIGURE 9

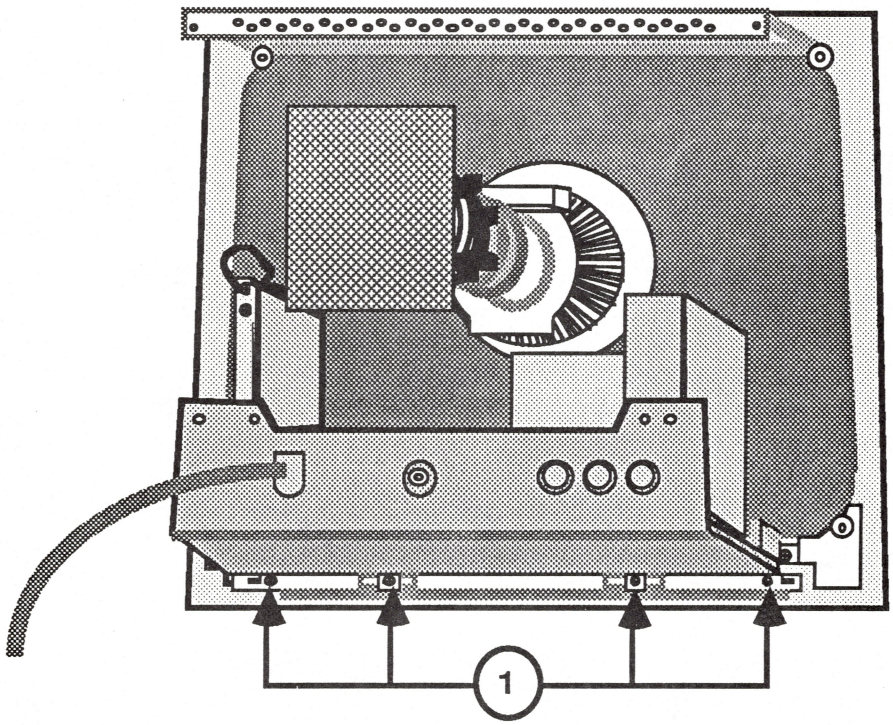


FIGURE 10

REMOVING THE MAIN LOGIC PCB - Series "S"

1. Turn off the monitor and unplug the AC cord.
2. Remove the rear cover. (See "Removing the Rear Cover.")
3. **DISCHARGE THE CRT.** (See "Discharging the Cathode Ray Tube [CRT].")
4. Locate the power supply board (Figure 9, #1).
5. Carefully disconnect all three connectors (CN9, CN10, and CN11) from the power supply board. (Refer to the labels on the outside of the board.)
6. Set the monitor face down (screen side down) on a protective pad.
7. Remove the four screws (Figure 10, #1) located between the bottom of the metal frame and the plastic case.

   NOTE: These are the only four screws securing the main logic PCB to the case.
8. Support the board with one hand as you tilt the monitor until it is sitting upright (on its feet). Turn the monitor so that the back is facing you.
9. Remove the screws (Figure 9, #2) which secure the CRT ground straps to <u>both sides</u> of the main chassis. (There is one screw on each side.)
10. Carefully pull the CRT socket board (Figure 9, #3) away from the CRT neck until it clears the neck base.
11. Cut any cable ties binding the CRT socket board wires together.
12. Remove all wires from the plastic cable clamp at the right of the CRT neck, just above the flyback transformer.

FIGURE 11

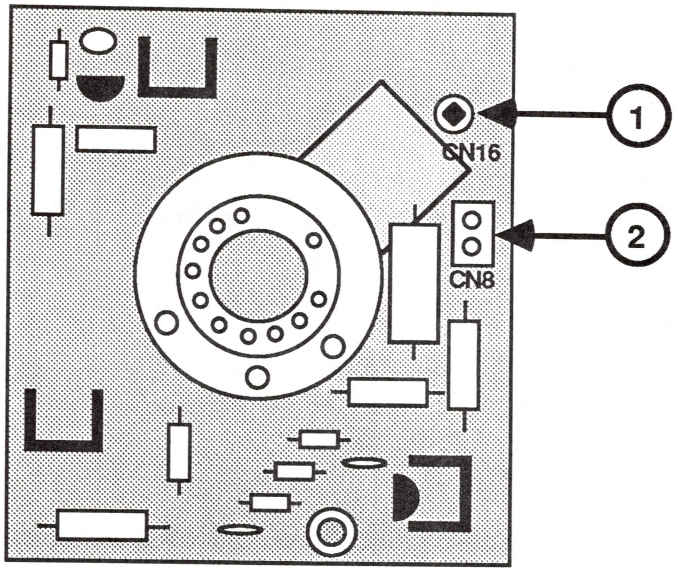
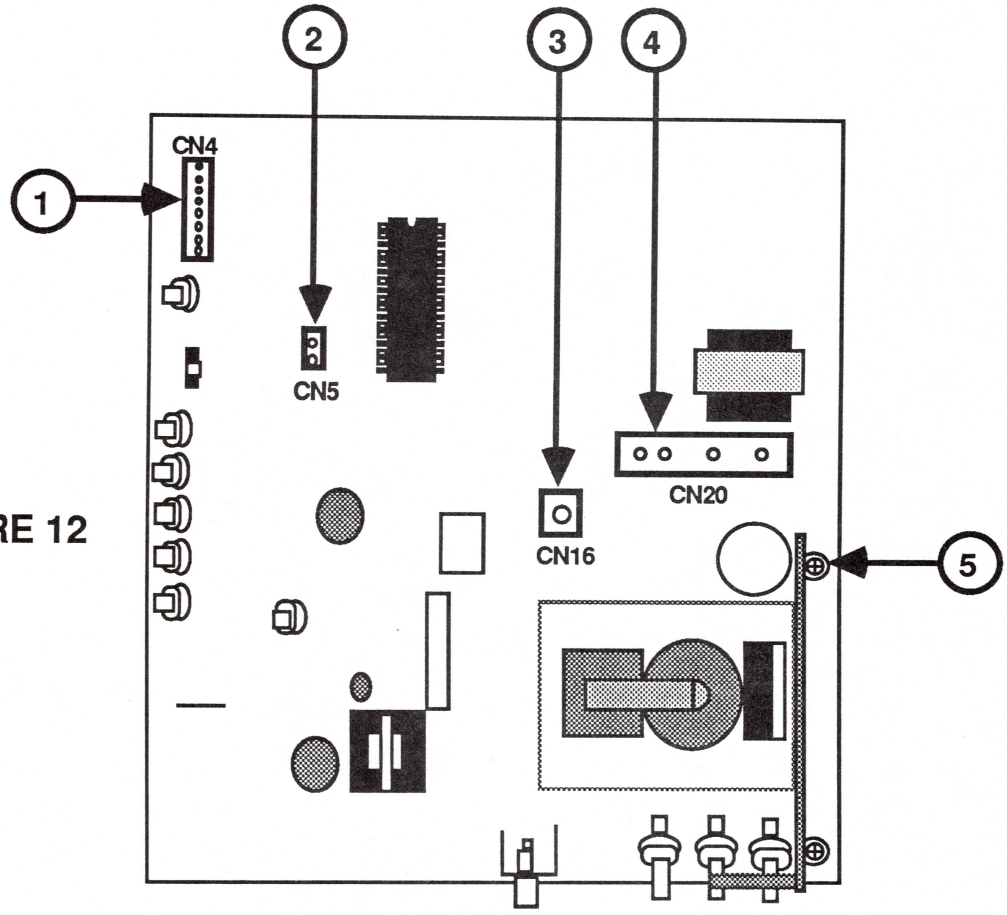


FIGURE 12



13. Turn the socket board so that you can see the component side, as shown in Figure 11.

14. Disconnect CN16 (Figure 11, #1) from the CRT socket board.

15. Very carefully slide the main logic PCB about three inches away from the front of the monitor.

16. Disconnect the following connectors from the main logic PCB:

    a) CN4 -- Figure 12, #1

    b) CN5 -- Figure 12, #2

    c) CN16 -- Figure 12, #3

    d) CN20 -- Figure 12, #4

17. Set the main logic PCB (with power supply board) aside.

IMPORTANT: Before returning the logic board to Apple, remove the two screws (one from above, one from below) that hold the rubber standoff (Figure 12, #5) in place between the logic board and the metal chassis, and remove the standoff. (Leaving the standoff in place during shipment may cause cracking of the board.) Reinstall the standoff and screws on the replacement logic board module.

If you are returning the main logic PCB to Apple, you must first also remove the power supply/panel/AC cord assembly and the three rear control knobs from the main logic PCB. See "Removing the Power Supply/Panel/AC Cord Assembly" for instructions.

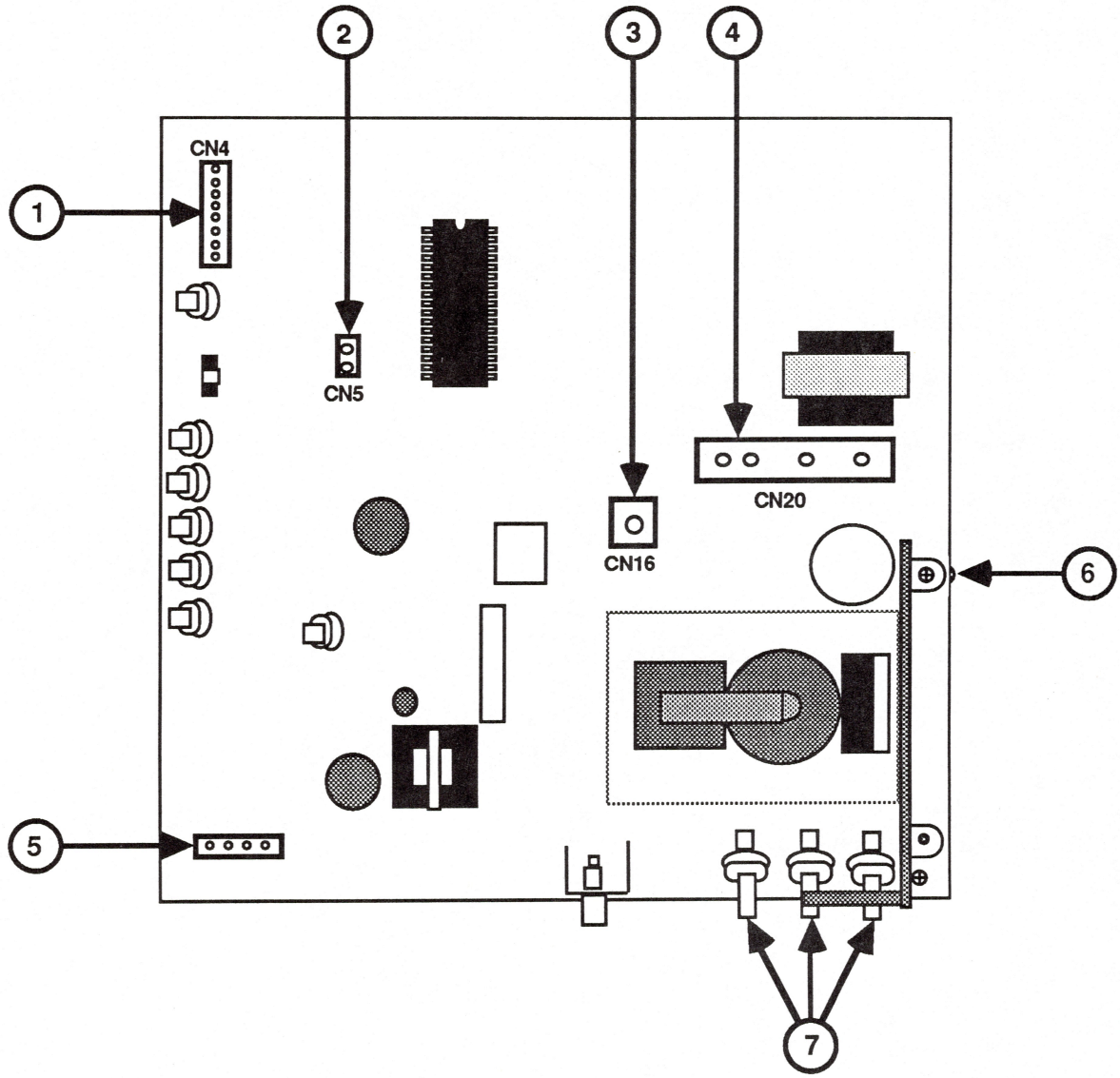


FIGURE 13

REPLACING THE MAIN LOGIC PCB - Series "S"

IMPORTANT: Before placing the logic board into the chassis, you must first install several items on the logic board.

A. The power supply board must be mounted to its bracket. (See "Replacing the Power Supply/Panel/AC Cord Assembly" for instructions.)

B. The rubber standoff that you removed from the defective board must be reinstalled. To do this, reinstall the two screws (one from above, one from below) that hold the rubber standoff (Figure 13, #6) in place between the logic board and the metal chassis.

C. The three rear plastic control knobs (Figure 13, #7) that you removed from the defective logic board must be replaced.

D. The power supply/panel/AC cord assembly must be replaced. (See "Replacing the Power Supply/Panel/AC Cord Assembly" for instructions.)

To replace the prepared logic board in the chassis:

1. Set the main logic board under the CRT neck about three inches away from the base of the CRT.

2. Connect the following connectors to the main logic PCB:

   a) CN4 -- Figure 13, #1 (the connector from the control PCB at the front of the monitor)

   b) CN5 -- Figure 13, #2 (the connector from the White Only switch at the front of the monitor)

   c) CN16 -- Figure 13, #3 (the black wire coming off the silver ground strap surrounding the CRT)

   d) CN20 -- Figure 13, #4 (the large connector coming off the CRT neck)

   e) CN14 -- Figure 13, #5 (the connector with four colored wires that are soldered at the other end to the CRT socket board)

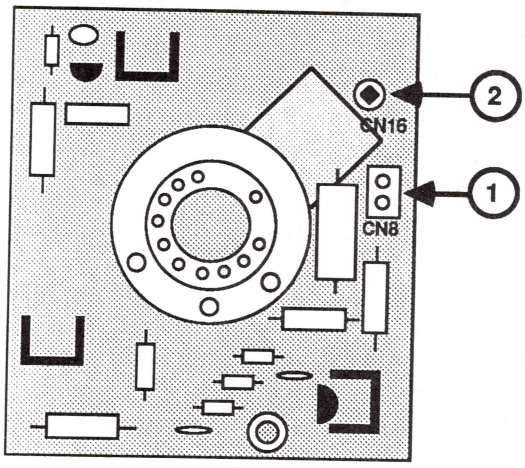


FIGURE 14

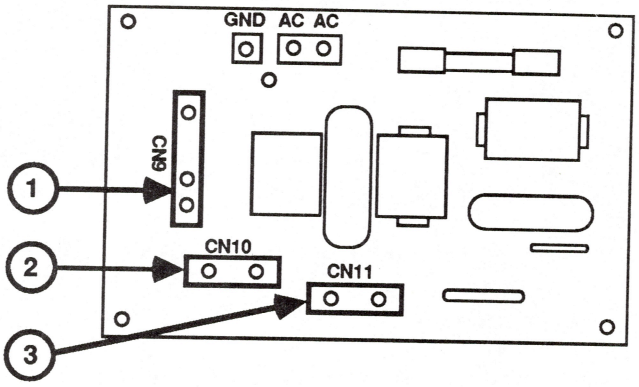


FIGURE 15

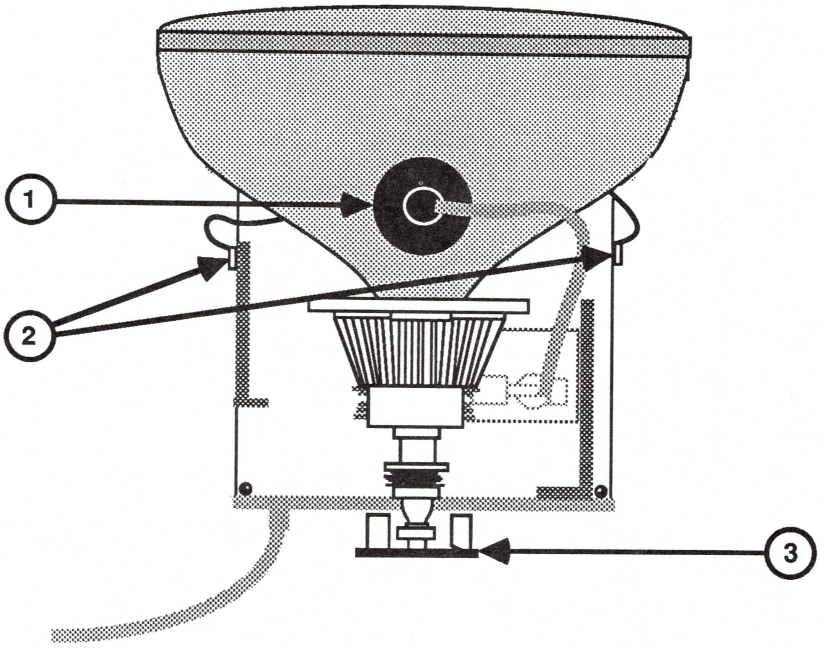


FIGURE 16

3. Turn the CRT socket board so that you can see the component side (Figure 14).

4. Connect the following connectors to the CRT socket board:

   a) CN8 -- Figure 14, #1 (the connector with two wires that are soldered at their other end to the logic board).

   b) Connect the remaining black single connector to CN16 on the CRT socket board (Figure 14, #2). This is the connector attached to the green CRT ground strap at the side of the monitor.

   CAUTION: Be sure that all the connector wires are placed under the CRT neck.

5. Replace the CRT socket board (Figure 16, #3). It fits only one way.

6. Connect the following connectors to the power supply board:

   a) CN9 (green, white, and black) -- Figure 15, #1

   b) CN10 (white) -- Figure 15, #2

   c) CN11 (red) -- Figure 15, #3

7. Replace the anode cap (Figure 16, #1).

8. Replace the screws (Figure 16, #2) to secure the CRT ground straps to both sides of the main chassis.

9. Slide the main logic PCB toward the front end of the monitor as far as it will go.

10. Support the main logic PCB with one hand as you tilt it until it is resting on its screen side.

11. Replace the four main screws used to secure the main logic PCB to the case. These screw holes are located between the bottom of the metal frame and the plastic case.

12. Replace the rear cover. (See "Replacing the Rear Cover.")

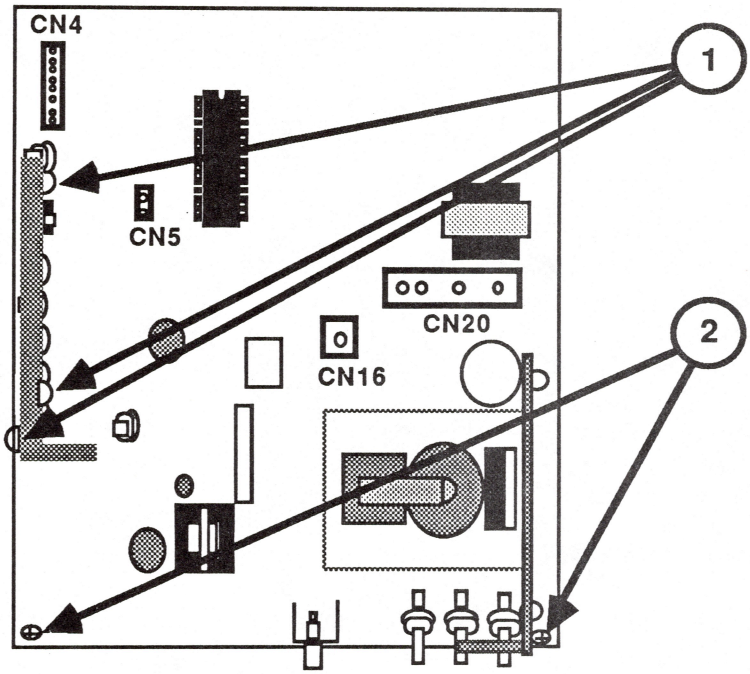


FIGURE 17

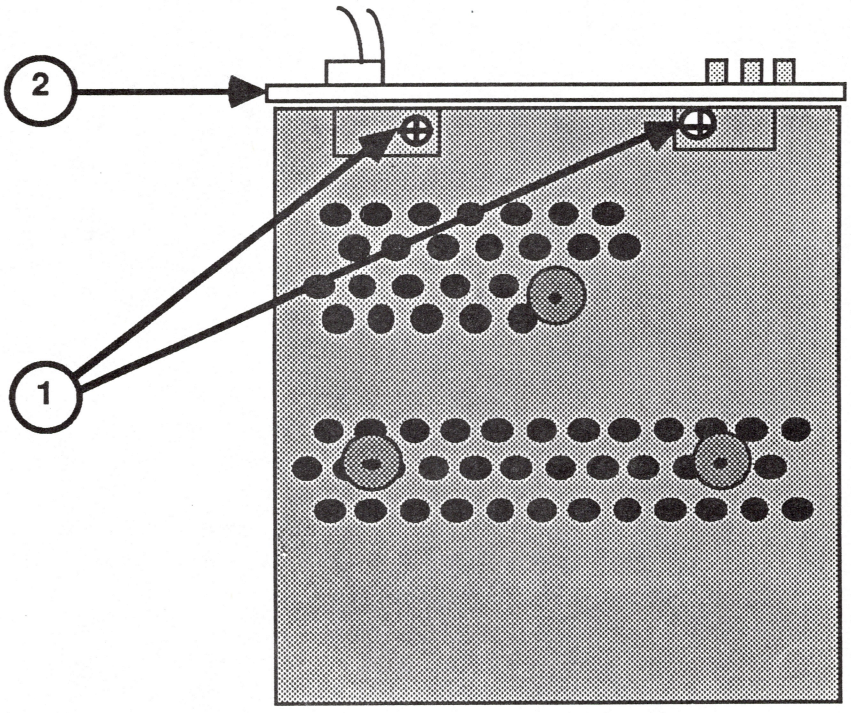


FIGURE 18

REMOVING THE POWER SUPPLY/PANEL/AC CORD ASSEMBLY - Series "S"

1. Turn off the monitor and unplug the AC cord.
2. Remove the rear cover. (See "Removing the Rear Cover.")
3. Discharge the CRT. (See "Discharging the Cathode Ray Tube [CRT].")
4. Remove the main logic PCB. (See "Removing the Main Logic PCB.")
5. Remove the two mounting screws from the inside corners of the power supply board and the one remaining mounting screw on the outside corner (Figure 17, #1).
6. Remove the two screws (Figure 17, #2) from the rear corners of the main logic PCB.
7. Tip up the logic board frame so you can see the bottom.
8. Remove the two screws (Figure 18, #1) from the bottom of the metal frame.
9. Pull the rear panel (Figure 18, #2), along with the AC cord and power supply board, away from the monitor.

REPLACING THE POWER SUPPLY/PANEL/AC CORD ASSEMBLY - Series "S"

1. Place the rear panel over the three controls at the back of the main logic PCB. The supports on the bottom edge of the plastic panel fit flush between the logic board and its metal chassis.
2. Replace the two screws (Figure 17, #2) at the rear corners of the main logic PCB.
3. Replace the two screws (Figure 18, #1) to secure the rear panel to the bottom of the metal chassis.
4. Replace the three mounting screws (Figure 17, #1) which secure the power supply board bracket to the logic board frame.
5. Replace the main logic PCB. (See "Replacing the Main Logic PCB.")
6. Replace the rear cover. (See "Replacing the Rear Cover.")

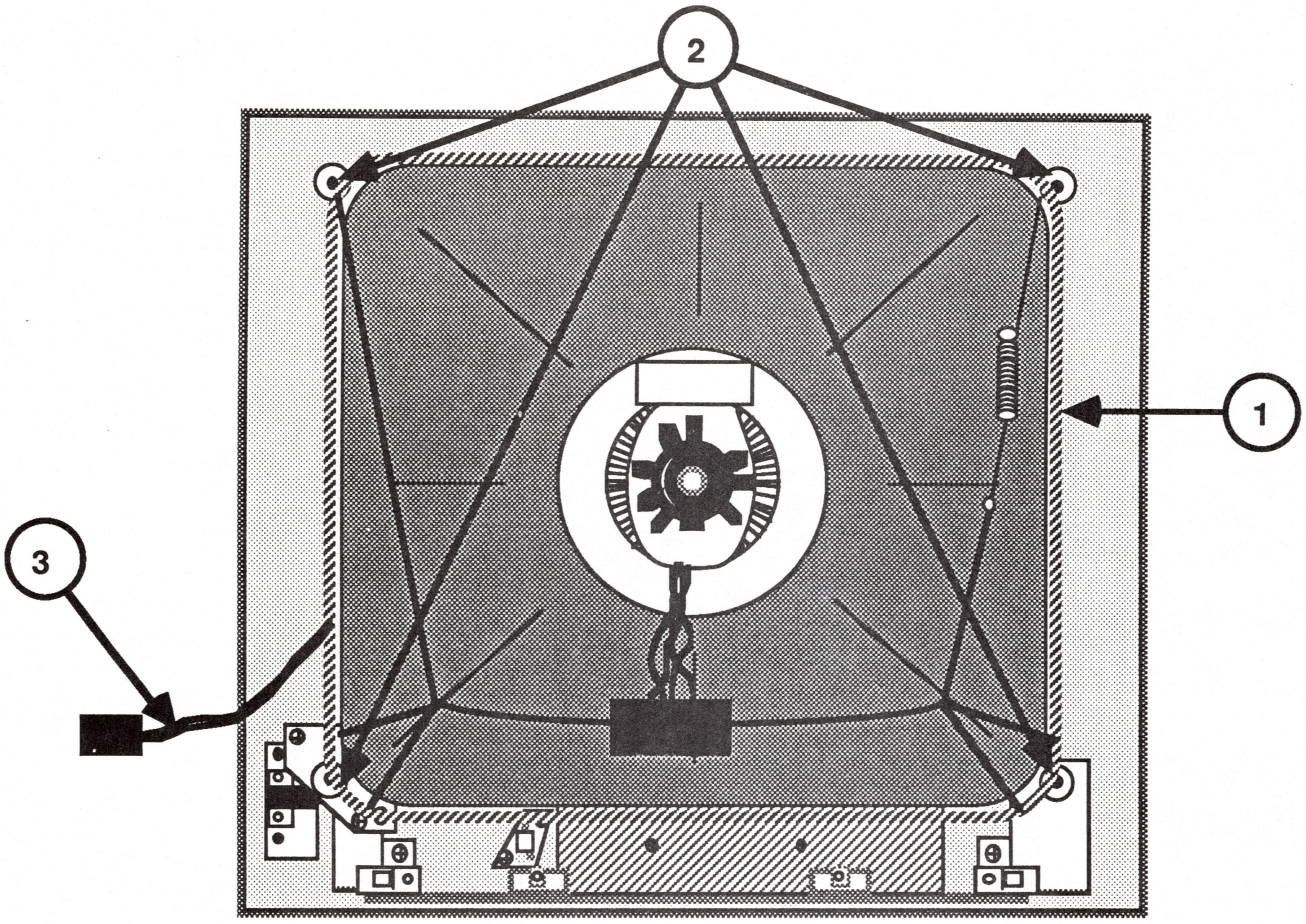


FIGURE 19

REMOVING THE CATHODE RAY TUBE [CRT] - Series "S"

1. Turn off the monitor and disconnect the AC cord.
2. Remove the rear cover. (See "Removing the Rear Cover.")
3. **DISCHARGE THE CRT.** (See "Discharging the Cathode Ray Tube [CRT].")
4. Remove the main logic PCB. (See "Removing the Main Logic PCB.")
5. Place the monitor face down on a protective pad.
6. Locate the degaussing coil (Figure 19, #1). It is braced to the CRT by plastic coated holding tabs at each corner.
7. Bend the tabs out to free the degaussing coil. Lift the coil away from the CRT.
8. Remove the four CRT mounting screws (Figure 19, #2), the washers, and holding tabs.
9. Carefully lift the CRT off the front bezel.

WARNING: IF YOU INTEND TO DISPOSE OF THE CRT, REFER TO "Disposing of the Cathode Ray Tube" IN SECTION 1.

REPLACING THE CATHODE RAY TUBE [CRT] - Series "S"

1. Place the front bezel face down on a clean, soft surface.
2. Carefully set the CRT inside the bezel (see Figure 19).
3. Replace the holding tabs, washers, and CRT mounting screws (Figure 19, #2).
4. Place the degaussing coil over the CRT so that the connector (Figure 19, #3) is at your left (when facing the back of the monitor).
5. Bend the holding tab stems around the degaussing coil to secure the coil to the CRT.
6. Replace the main logic PCB. (See "Replacing the Main Logic PCB.")
7. Replace the rear cover. (See "Replacing the Rear Cover.")

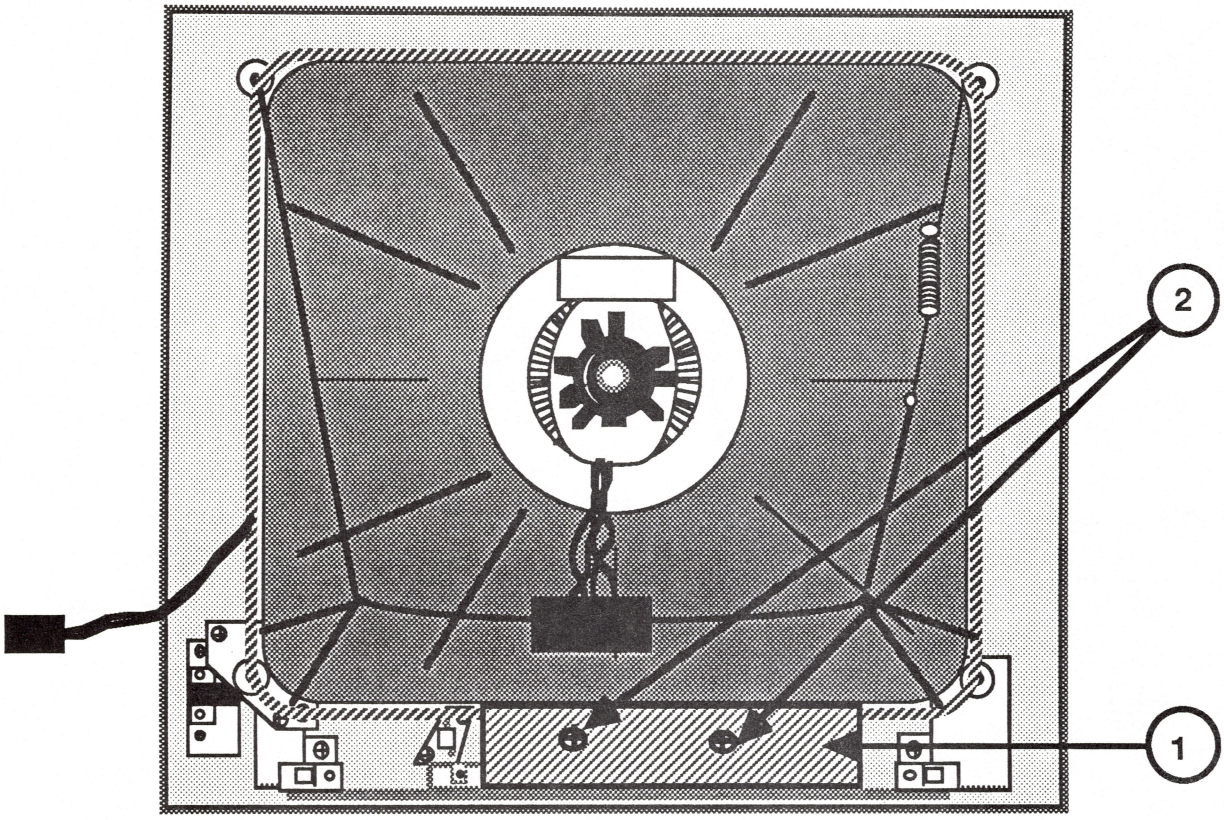


FIGURE 20

REMOVING THE CONTROL PCB - Series "S"

1. Turn off the monitor and disconnect the AC cord.
2. Remove the rear cover. (See "Removing the Rear Cover.")
3. **DISCHARGE THE CRT.** (See "Discharging the Cathode Ray Tube [CRT].")
4. Remove the main logic PCB. (See "Removing the Main Logic PCB.")
5. Place the monitor face down.
6. Locate the control PCB (Figure 20, #1).
7. Remove the two mounting screws (Figure 20, #2).
8. Lift the control PCB just high enough to turn it over and disconnect the power LED (CN15) from the component side. (This connector must be detached before you can completely remove the control PCB.)
9. Remove the four plastic control knobs and retain them to use on the replacement control PCB.

REPLACING THE CONTROL PCB - Series "S"

1. Install the customer's four plastic control knobs on the replacement control PCB.
2. Connect the power LED (CN15) to the control PCB. There is only one way it will fit.
3. Set the control PCB into the bezel so that the control knobs protrude through the holes on the front panel (they only fit one way). The control PCB connector should extend to the left as you face the back of the monitor.
4. Replace the two control PCB mounting screws (Figure 20, #2).
5. Replace the main logic PCB. (See "Replacing the Main Logic PCB.")
6. Replace the rear cover. (See "Replacing the Rear Cover.")

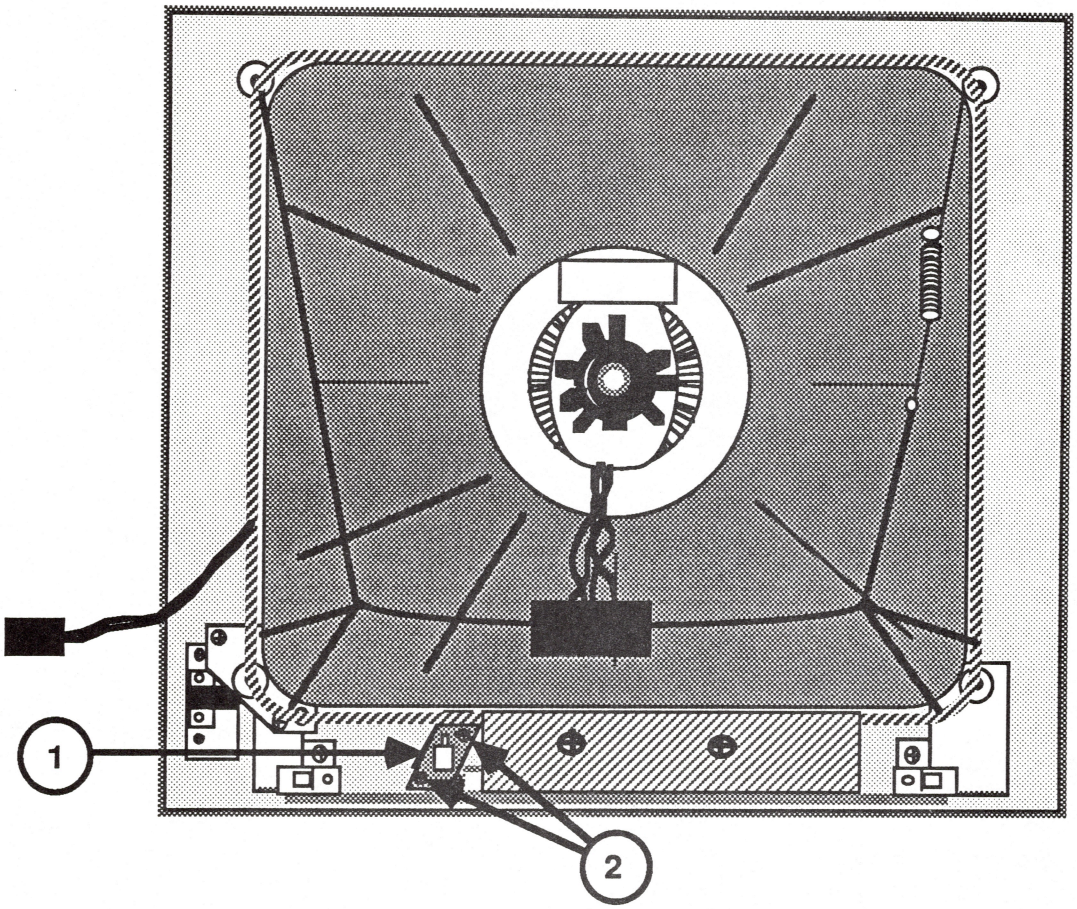


FIGURE 21

REMOVING THE WHITE ONLY SWITCH - Series "S"

1. Turn off the monitor and disconnect the AC power cord.
2. Remove the rear cover. (See "Removing the Rear Cover.")
3. **DISCHARGE THE CRT.** (See "Discharging the Cathode Ray Tube [CRT].")
4. Remove the main logic PCB. (See "Removing the Main Logic PCB.")
5. Locate the White Only switch (Figure 21, #1).
6. Remove the two screws (Figure 21, #2) that secure the switch plate to the front bezel.
7. Lift the switch out.
8. Remove the plastic knob from the switch and retain it to use on the replacement switch.

   CAUTION: Be especially careful when removing this knob. The knob mounting is flexible and can easily be broken, requiring replacement of the whole switch. Use the fingers of one hand to hold the mounting down **very securely** while you pull the knob off its shank.

REPLACING THE WHITE ONLY SWITCH - Series "S"

1. Install the customer's plastic knob over the switch shank.
2. Set the switch into the front bezel so that the plastic post protrudes through the hole in the switch plate (Figure 21, #1).
3. Replace the two mounting screws (Figure 21, #2).
4. Replace the main logic PCB. (See "Replacing the Main Logic PCB.")
5. Replace the rear cover. (See "Replacing the Rear Cover.")

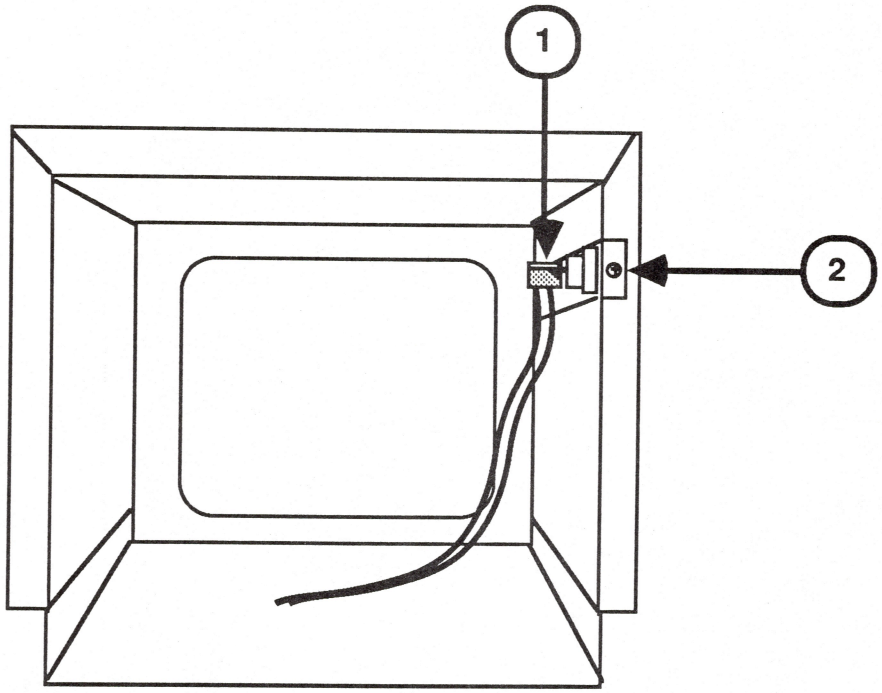


FIGURE 22

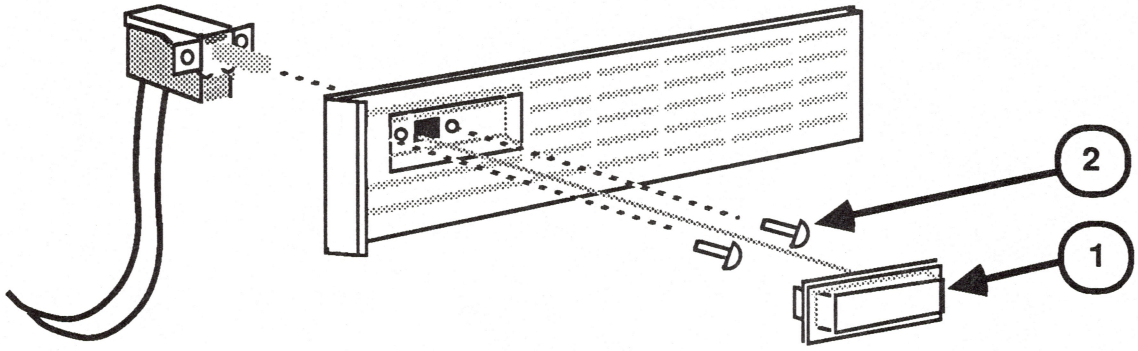


FIGURE 23

REMOVING THE ON/OFF SWITCH (IIc ColorMonitor only) - Series "S"

1. Turn off the monitor and disconnect the AC cord.
2. Remove the rear cover. (See "Removing the Rear Cover.")
3. **DISCHARGE THE CRT.** (See "Discharging the Cathode Ray Tube [CRT].")
4. Locate the on/off switch (Figure 22, #1) inside the rear cover. It is mounted on a plastic bracket which is attached to the side of the rear cover.

   CAUTION: MAKE SURE THE ON/OFF SWITCH IS DISCONNECTED FROM THE POWER SUPPLY BOARD.

5. Remove the screw (Figure 22, #2) which secures the plastic bracket to the rear cover.
6. Pull the switch button (Figure 23, #1) off its shaft.
7. Remove the two screws (Figure 23, #2) which secure the on/off switch to the plastic bracket.

REPLACING THE ON/OFF SWITCH - Series "S"

1. Replace the two mounting screws (Figure 23, #2) to secure the on/off switch to its bracket.
2. Snap the switch button (Figure 23, #1) onto the switch shaft.
3. Replace the screw (Figure 22, #2) that secures the bracket to the inside of the rear cover.
4. Replace the rear cover. (See "Replacing the Rear Cover.")

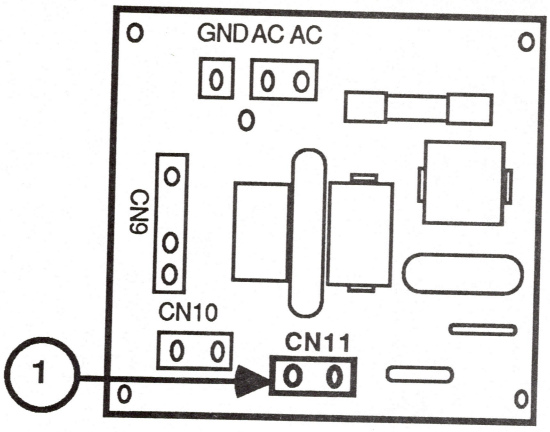


FIGURE 24

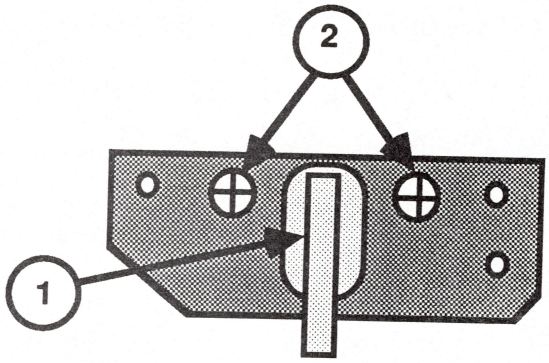


FIGURE 25

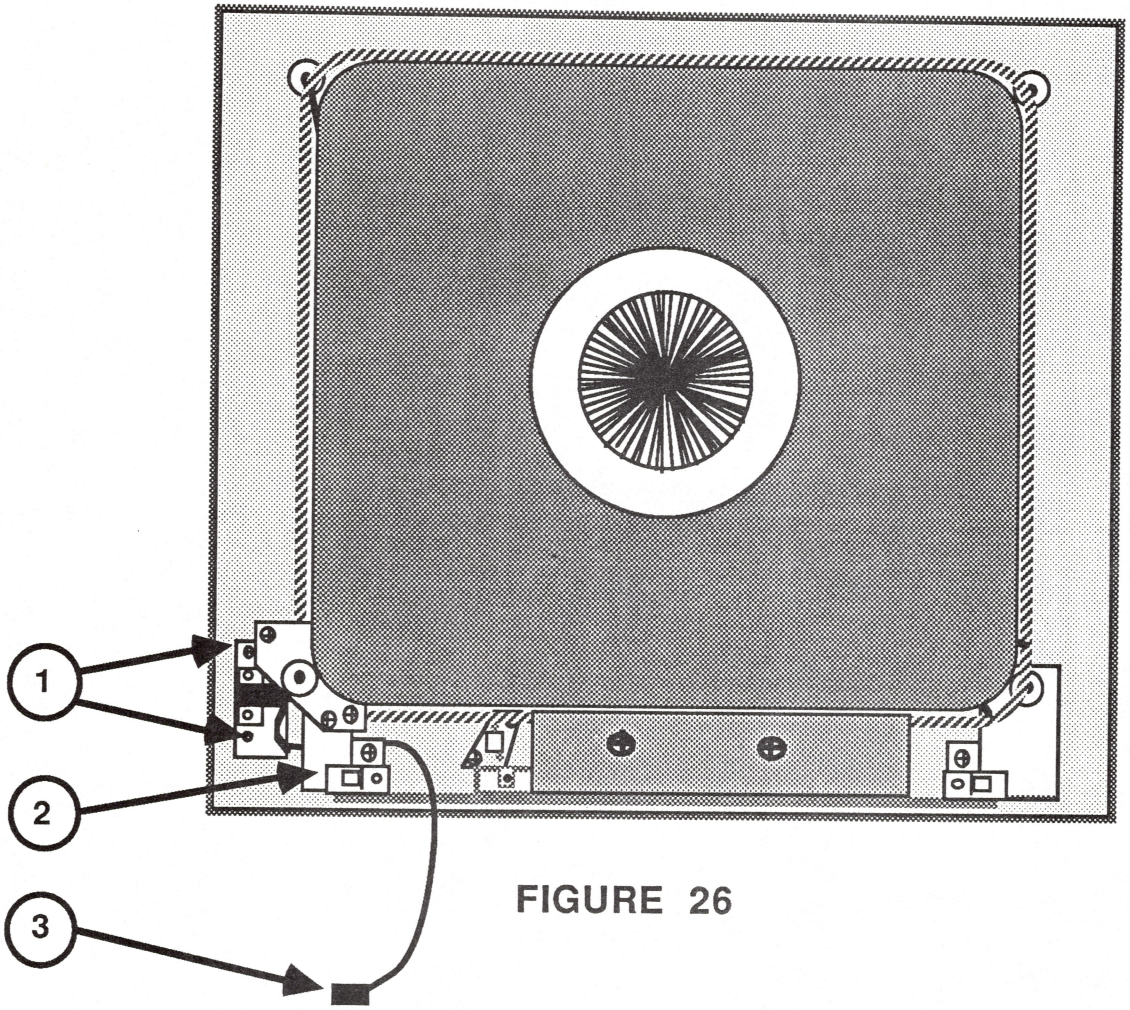


FIGURE 26

REMOVING THE ON/OFF SWITCH (IIe ColorMonitor only) - Series "S"

1. Turn off the monitor and disconnect the AC cord.
2. Remove the rear cover. (See "Removing the Rear Cover.")
3. **DISCHARGE THE CRT.** (See "Discharging the Cathode Ray Tube [CRT]".)
4. Disconnect the on/off switch connector (CN11) from the power supply board. (Figure 24, #1.)
5. Remove the two screws (Figure 26, #1) which secure the metal switch bracket to the bezel.
5. Lift the switch out, jiggling to free the plastic switch button from the bezel.
6. Pull the plastic switch button (Figure 25, #1) off the switch assembly.
7. Remove the two screws (Figure 25, #2) which secure the on/off switch to the metal bracket.

REPLACING THE ON/OFF SWITCH (for IIe only) - Series "S"

1. Replace the plastic switch button over the switch shaft.
2. Replace the two screws (Figure 25, #2) to secure the on/off switch to the metal bracket.
3. Slide the switch connector under the CRT mounting bracket (Figure 26, #2) and pull the wire through until the switch meets its slot in the front bezel.
4. Replace the two screws (Figure 26, #1) to secure the switch to the front bezel.
5. Connect the switch connector (CN11) (Figure 26, #3) to the power supply board (Figure 24, #1).
6. Replace the rear cover. (See "Replacing the Rear Cover.")

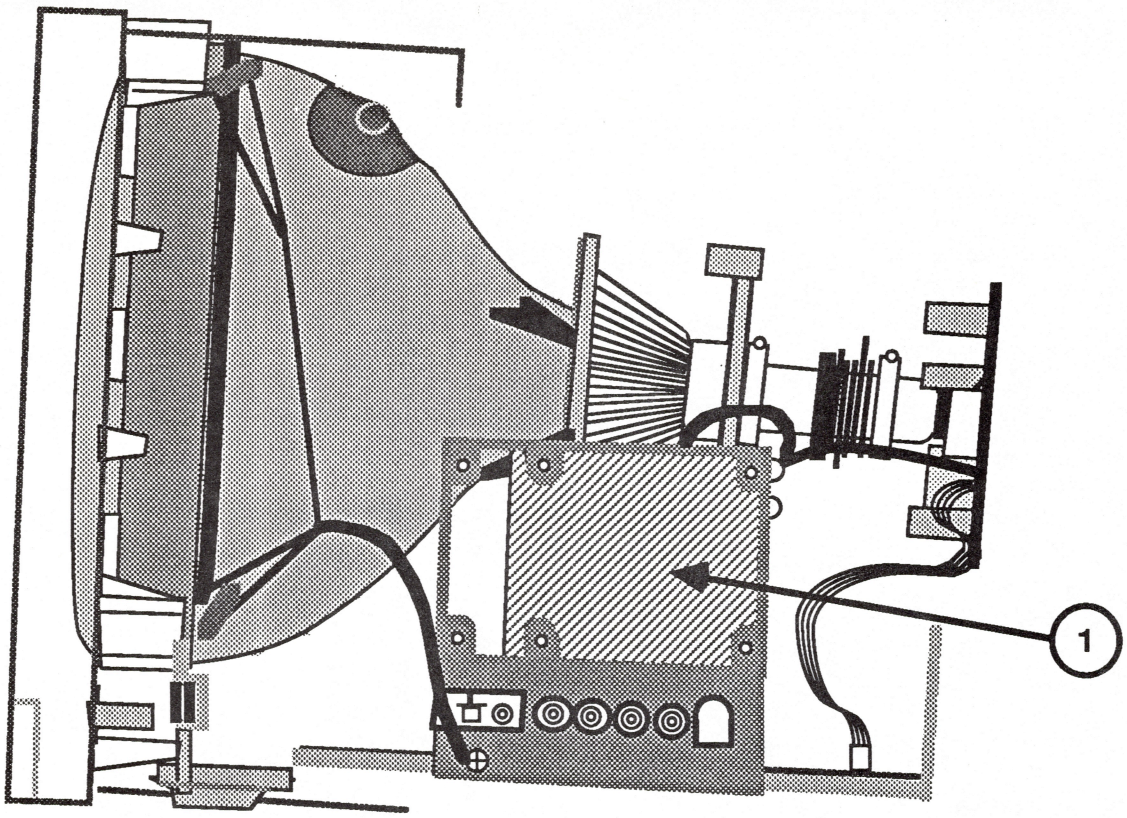


FIGURE 27

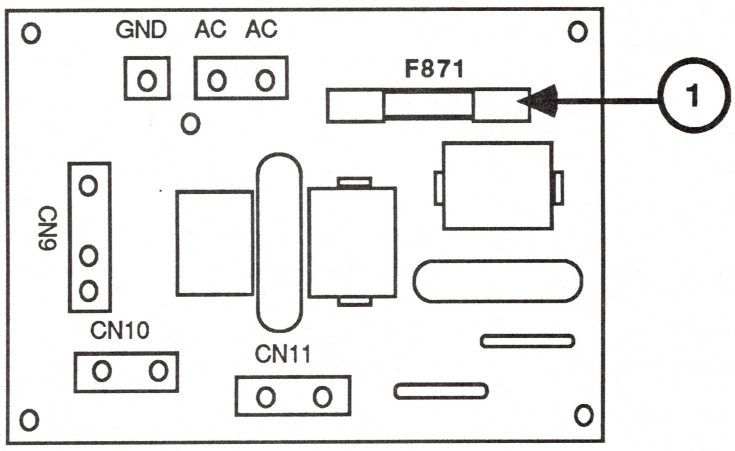


FIGURE 28

REPLACING THE POWER SUPPLY FUSE (F871) - Series "S"

The power supply fuse is mounted on the component side of the power supply board (Figure 27, #1). You do not have to remove the board in order to replace the fuse.

NOTE: Fuse F871 should be replaced with a 250V 3A Slow Blow fuse.

1. Disconnect the AC power cord.

2. Remove the rear cover. (See "Removing the Rear Cover.")

3. **DISCHARGE THE CRT.** (See "Discharging the Cathode Ray Tube [CRT].")

4. Locate fuse F871 (Figure 28, #1).

5. Carefully pry at one metal end, then the other, to remove the fuse from the fuse holder.

   CAUTION: DO NOT TRY TO SLIDE THE FUSE SIDEWAYS. YOU MAY BREAK THE FUSE HOLDER.

6. Snap in the 250V 3A Slow Blow fuse.

7. Replace the rear cover. (See "Replacing the Rear Cover.")

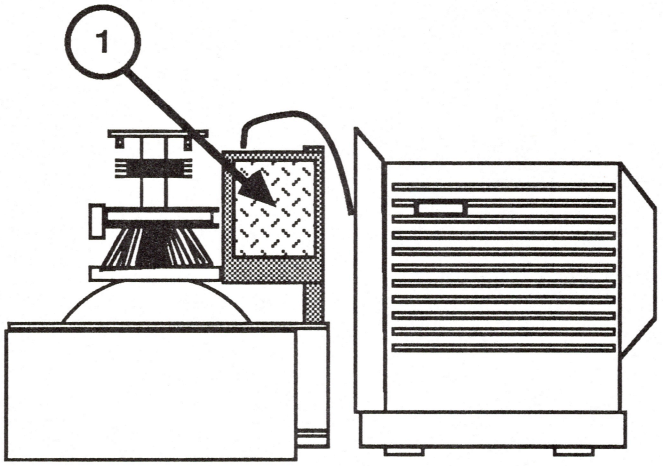


FIGURE 29

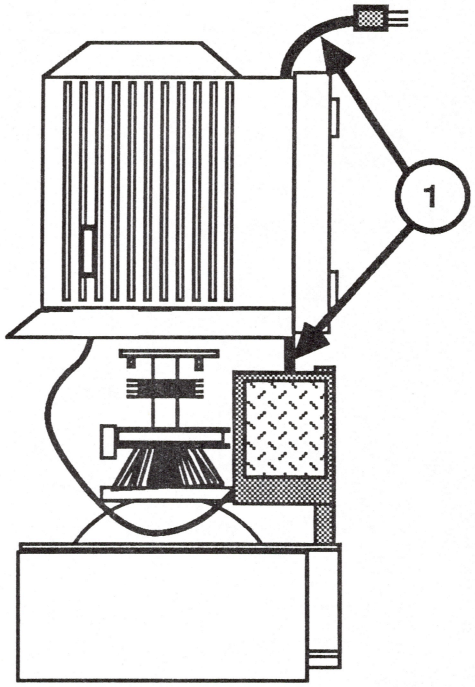


FIGURE 30

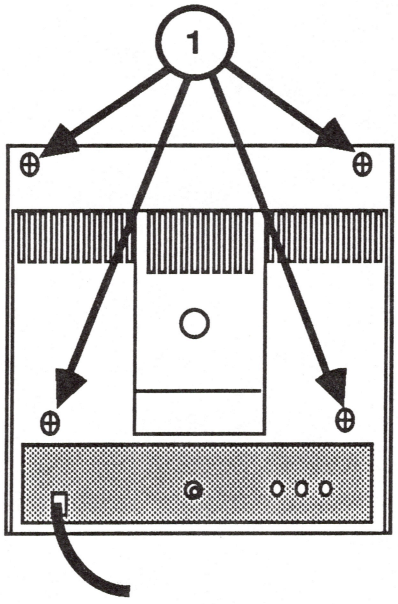


FIGURE 31

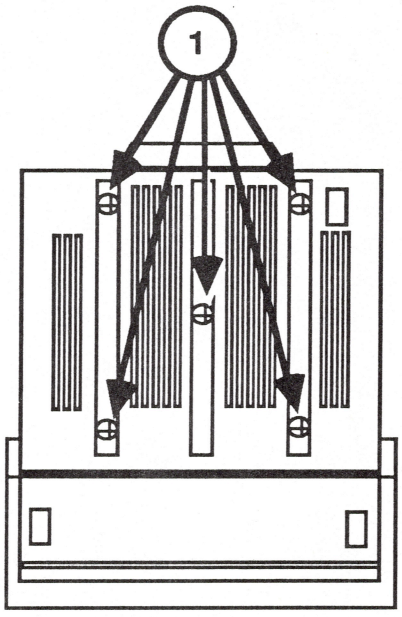


FIGURE 32

REPLACING THE REAR COVER (IIc ColorMonitor only) - Series "S"

1. Orient the rear cover and monitor as shown in Figure 29; the monitor is face down and the rear cover is upright.

2. Connect the power switch cable (from inside the rear cover) to CN11 on the power supply board (Figure 29, #1).

   NOTE: The connectors (CN) are labeled on the both sides of the power supply board.

3. Feed the AC power cord through the opening in the rear cover while you lower the cover onto the monitor (Figure 30, #1).

4. Replace the four screws (Figure 31, #1) at the back of the monitor.

5. Replace the five screws (Figure 32, #1) at the bottom of the monitor.

   NOTE: If the monitor came with antistatic rubber grommets covering the five bottom case screws, replace them by pushing them firmly over the screw heads.

6. Set the monitor back on its feet.

7. Run the monitor tests on the Apple II Peripherals Diskette (or equivalent) to verify that the monitor is functioning properly. Equivalent diagnostics are those that generate color bars or test patterns and can thus verify the monitor's color operation.

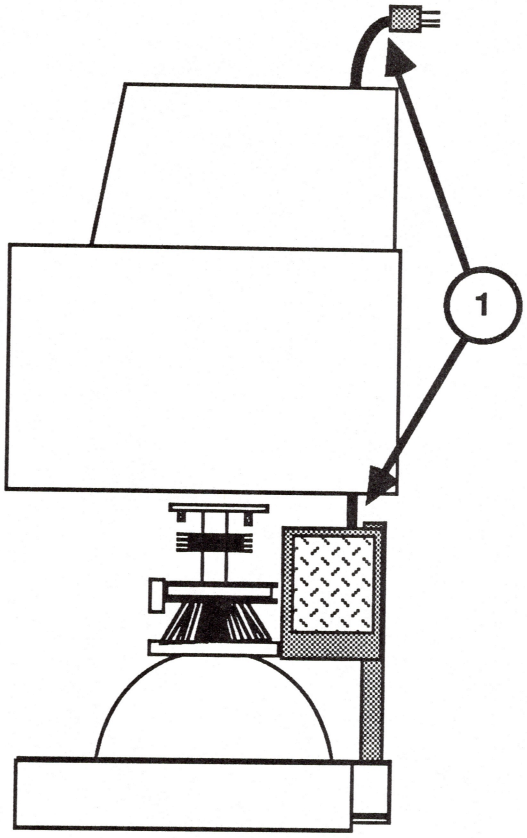


FIGURE 33

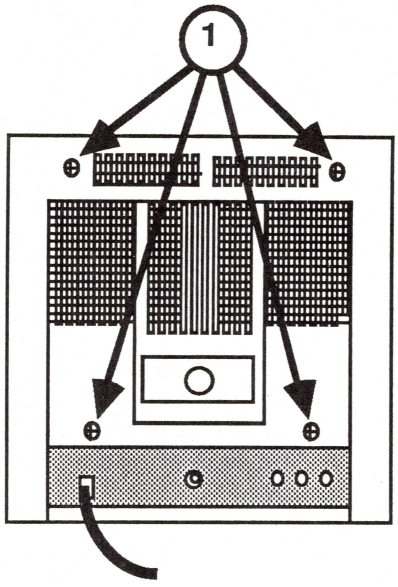


FIGURE 34

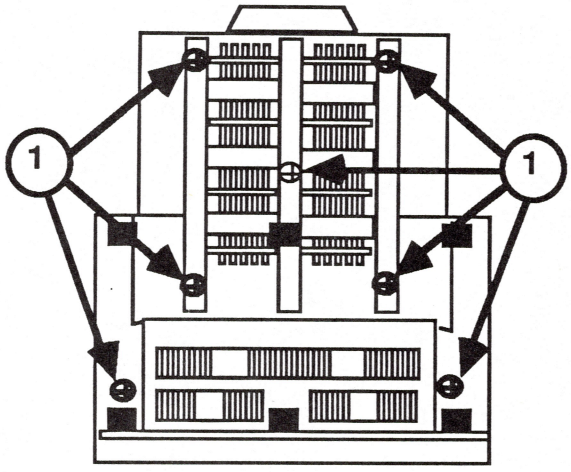


FIGURE 35

REPLACING THE REAR COVER (IIe ColorMonitor only) - Series "S"

1. Feed the AC power cord through the opening in the cover while you lower the cover onto the monitor (Figure 33, #1).

2. Replace the four screws (Figure 34, #1) at the back of the monitor.

3. Replace the seven screws (Figure 35, #1) at the bottom of the monitor.

4. Run the monitor tests on the Apple II Peripherals Diskette (or equivalent) to verify that the monitor is functioning properly. Equivalent diagnostics are those that generate color bars or test patterns and can thus verify the monitor's color operation.

Apple ColorMonitor IIc/IIe
Technical Procedures

Section 3

Take-Apart

Series "H"

Contents:

Removing the Rear Cover (for IIc).....3H.3
Removing the Rear Cover (for IIe).....3H.5
Discharging the Cathode Ray Tube (CRT).....3H.7
Removing and Replacing Procedures:
  Main Logic PCB.....3H.9
  Cathode Ray Tube (CRT).....3H.21
  LED Assembly (for IIc).....3H.25
  LED Assembly (for IIe).....3H.27
  Logic Board Fuses (F901 and F902).....3H.29
Replacing the Rear Cover (for IIc).....3H.31
Replacing the Rear Cover (for IIe).....3H.33

Rev. B Logic Board Replacement (Temporary Procedure)*
  Introduction.....3H.35
  Removing the Main Logic Board Assembly.....3H.37
  Removing the AC Power Cord and Back Panel.....3H.37
  Preparing the Rev. A Logic Board Service Module.....3H.39
  Installing the Rev. B Rear Panel and Power Cord
    on the Rev. A Main Logic Board Service Module....3H.41
  Installing the Prepared Rev. A Main Logic Board
    Module in the Rev. B Chassis.....3H.42

Rev. A Logic Board Replacement (Temporary Procedure)*
  Insert here purged pages 3H.7-20 (Nov 85).

* These two temporary procedures are to be used only as long as you have unreworked Rev. A logic board service modules in stock. After that time, they may be purged.

NOTE: For Series "S" Take-Apart, see the preceding section, beginning on page 3S.1.

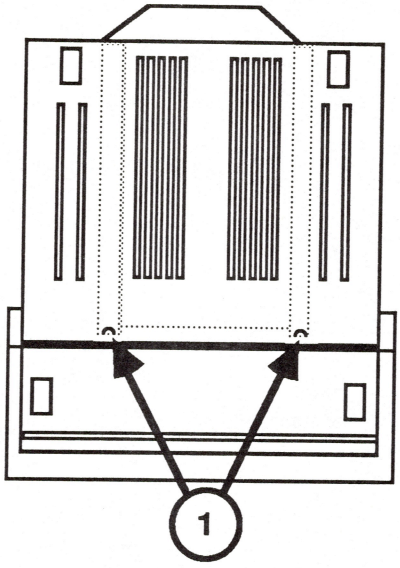


FIGURE 1

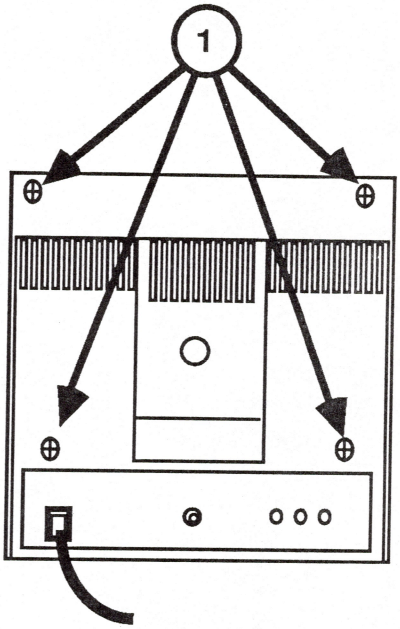


FIGURE 2

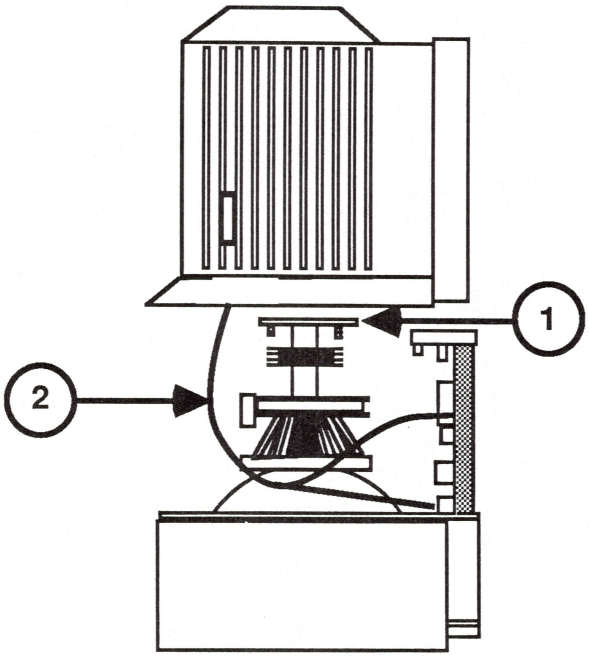


FIGURE 3

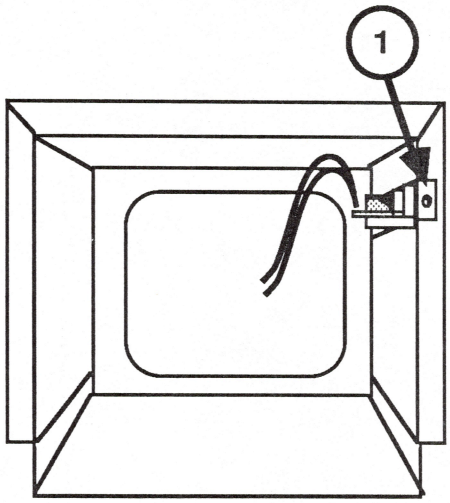


FIGURE 4

REMOVING THE REAR COVER (IIc ColorMonitor only) - Series "H"

1. Turn the monitor off and disconnect the power cord.

2. Disconnect the video cable from the back of the monitor.

3. Carefully set the monitor on its face (screen side) so that the back is facing up. (**NOTE:** The ColorMonitor contains sensitive components that can be damaged by rough treatment. Whenever it is necessary to turn the monitor over, be sure to rest it on a protective pad.)

4. Remove the two screws (Figure 1, #1) from the bottom of the monitor.

5. Remove the four screws (Figure 2, #1) from the back of the monitor.

6. Carefully pull the rear cover up until it clears the CRT socket board (Figure 3, #1) at the end of the CRT neck.

   CAUTION: Because the power (on/off) switch is attached to the rear cover, the power switch cable (Figure 3, #2) will prevent you from removing the cover completely until the on/off switch bracket is disconnected from the rear cover, as directed in Step 9 below.

7. Set the rear cover next to the monitor.

8. **DISCHARGE THE CRT.** (See "Discharging the Cathode Ray Tube.")

9. Locate the on/off switch inside the rear cover (see Figure 4). It is mounted on a plastic bracket which is attached to the side of the rear cover.

10. Remove the screw (Figure 4, #1) which secures the plastic bracket to the rear cover.

11. Pull the AC power cord through the opening in the rear cover. Set the rear cover aside. Set the monitor on its feet.

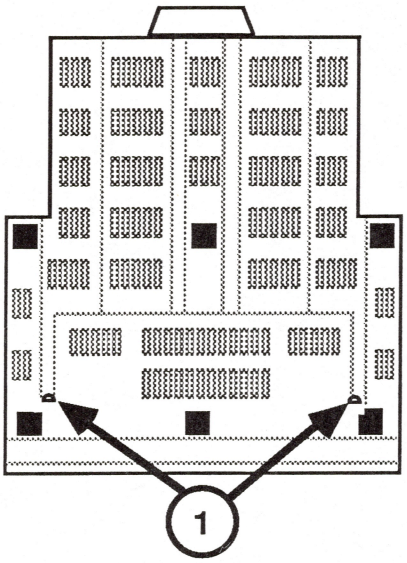


FIGURE 5

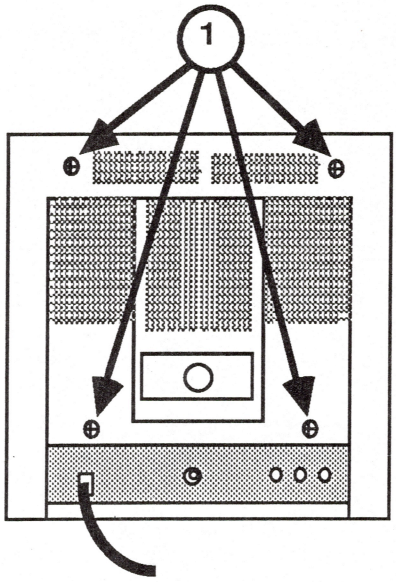


FIGURE 6

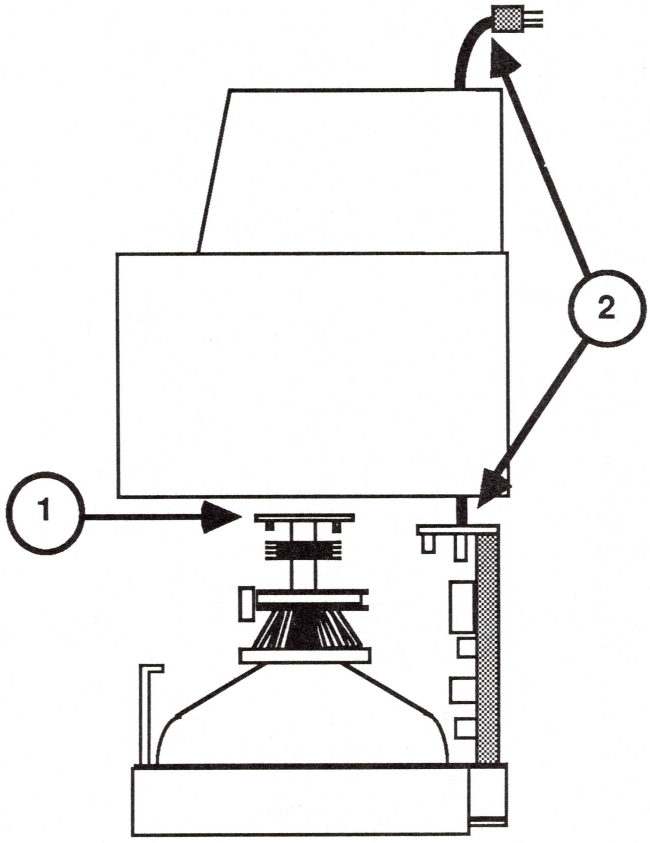


FIGURE 7

REMOVING THE REAR COVER (IIe ColorMonitor only) - Series "H"

1. Turn the monitor off and disconnect the AC cord.
2. Disconnect the video cable from the back of the monitor.
3. Carefully set the monitor on its face on a protective pad.
4. Remove the two screws (Figure 5, #1) from the bottom of the monitor.
5. Remove the four screws (Figure 6, #1) from the back of the monitor.
6. Carefully pull the rear cover up until it clears the CRT socket board (Figure 7, #1).
7. Pull the AC power cord (Figure 7, #2) through the opening in the rear cover.
8. Set the rear cover aside. Set the monitor on its feet.

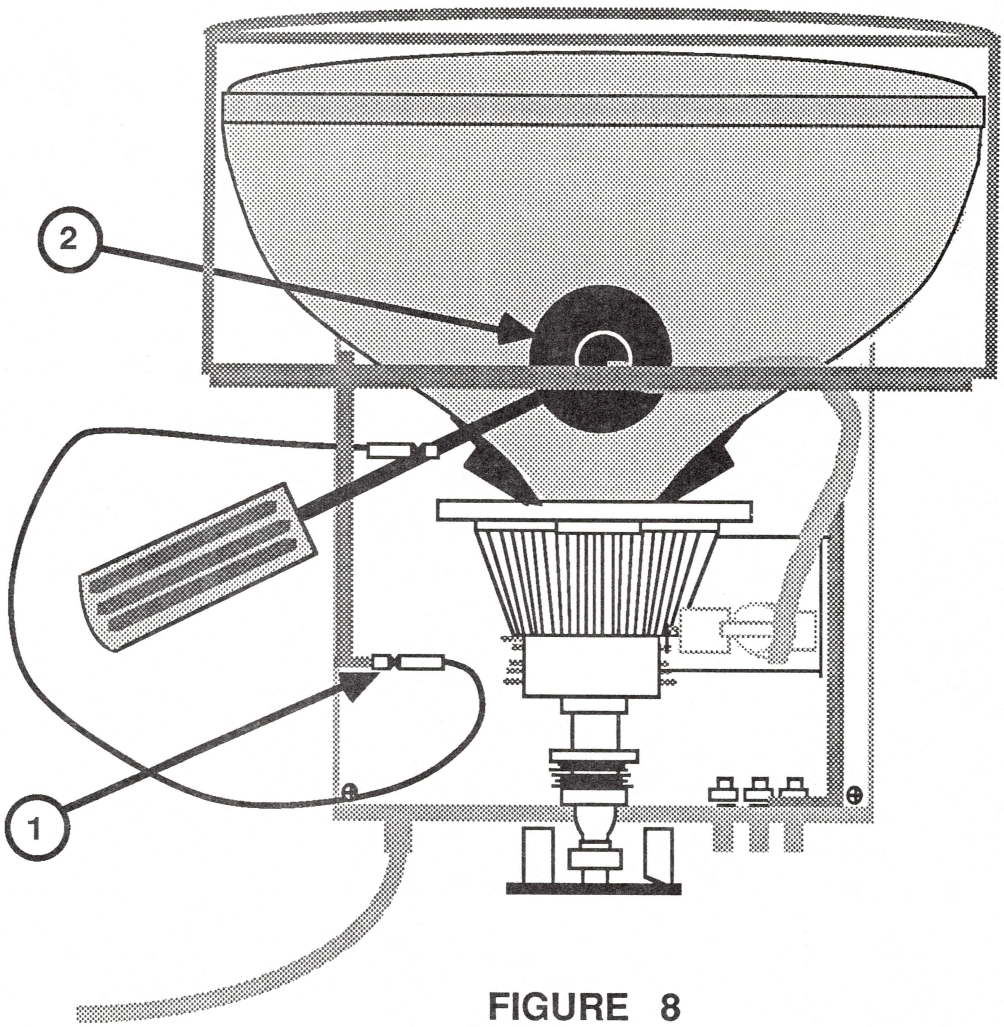


FIGURE 8

DISCHARGING THE CATHODE RAY TUBE (CRT) - Series "H"

1. Turn off the monitor and disconnect the AC power cord.

2. Remove the rear cover. ("See Removing the Rear Cover.")

3. Set the monitor upright, with the back facing you.

4. Remove any metal jewelry (rings, watches, bracelets, hanging necklaces, etc.) and grounding wriststraps.

5. Put on safety goggles.

6. Attach one end of an alligator lead to a long flatblade screwdriver, two inches from the insulated handle. Attach the other end to any part of the metal bracket surrounding the power supply board. (Figure 8, #1.)

   WARNING: USE ONLY ONE HAND WHILE DISCHARGING THE CRT. This is to eliminate any chance of your becoming a path for current should your hand slip and touch the metal part of the screwdriver. Grasp only the insulated handle of the screwdriver while discharging the CRT.

7. Slide the screwdriver under the CRT anode cap (Figure 8, #2) and push it towards the center of the cap until the blade contacts the metal anode ring.

   CAUTION: DO NOT USE FORCE. If it is difficult to get the screwdriver under the anode cap, use a smaller screwdriver to loosen the suction of the anode cap on the tube. Discharge the anode by holding the large screwdriver against the anode ring for five seconds.

8. Remove the screwdriver and disconnect it from the alligator clip.

9. Peel back the anode cap until you can see the anode ring at the center. Look at the metal connector in the center of the cap and notice how it is clipped into the CRT. Push on the cap in one direction, freeing the metal connector from the CRT, and lift the cap off the tube.

   NOTE: A secondary charge can build up even after you have discharged the CRT. To ensure that any residual charge is dissipated during the service procedure, establish a ground lead by fastening one alligator clip to the metal chassis and the other clip to the edge of the anode aperture.

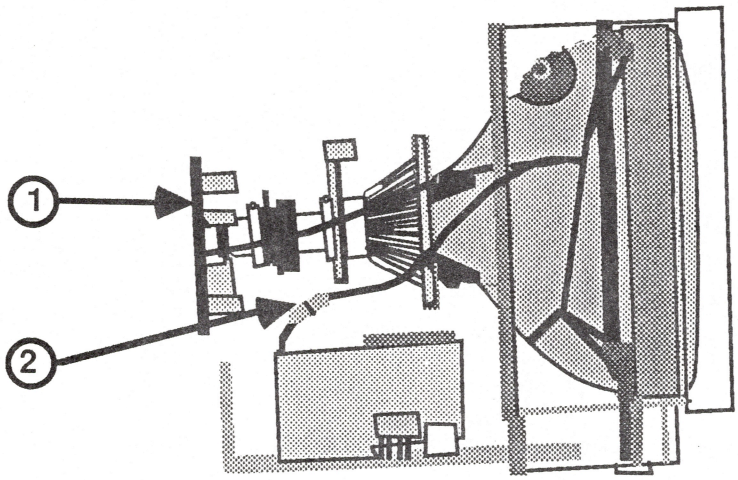


FIGURE 9

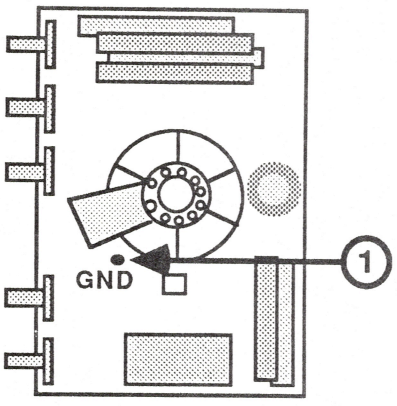


FIGURE 10

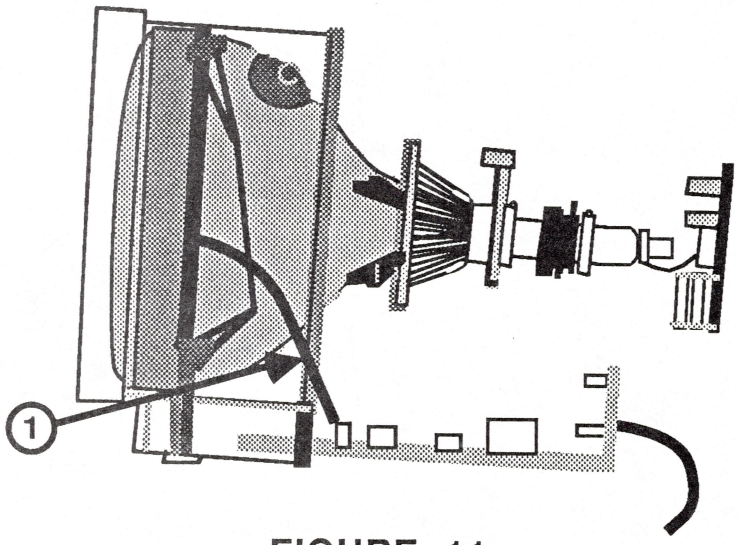


FIGURE 11

REMOVING THE MAIN LOGIC PCB - Series "H"

1. Turn off the monitor and unplug the AC cord.
2. Remove the rear cover. (See "Removing the Rear Cover.")
3. **DISCHARGE THE CRT.** (See "Discharging the Cathode Ray Tube.")
4. Carefully pull the CRT socket board (Figure 9, #1) away from the CRT neck until it clears the neck base.
5. Turn the socket board so that you can see the component side, as shown in Figure 10.
6. Disconnect the gray CRT ground strap from its connection (Figure 10, #1) on the CRT socket board.
7. Disconnect the white CRT ground strap at its plug-in connector (Figure 9, #2).
8. Remove all wires from the plastic cable clamps.
9. Disconnect the degaussing coil ground strap (Figure 11, #1) from connector W on the main logic PCB.

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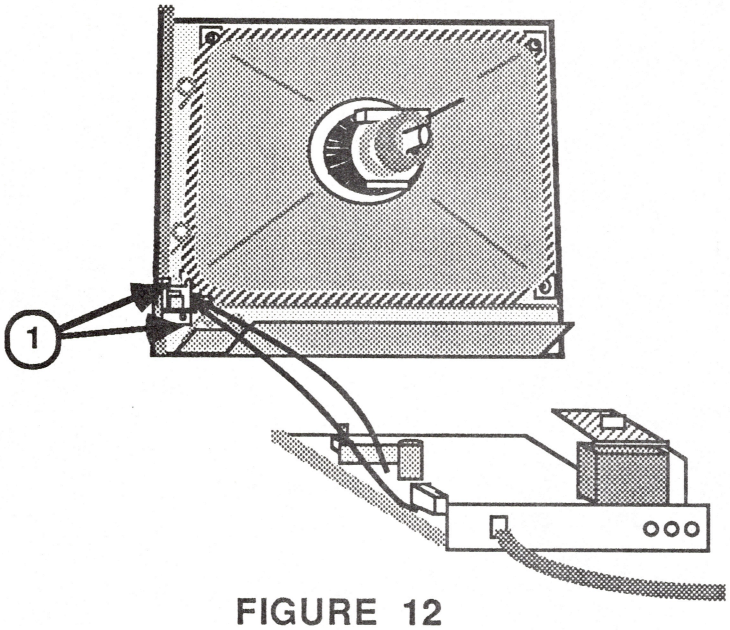

FIGURE 12

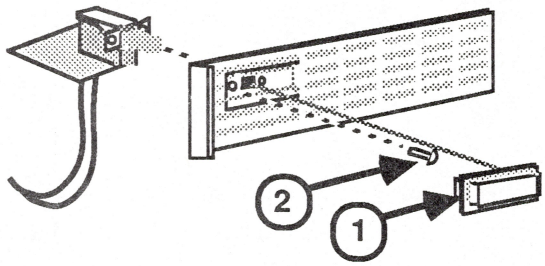

FIGURE 13

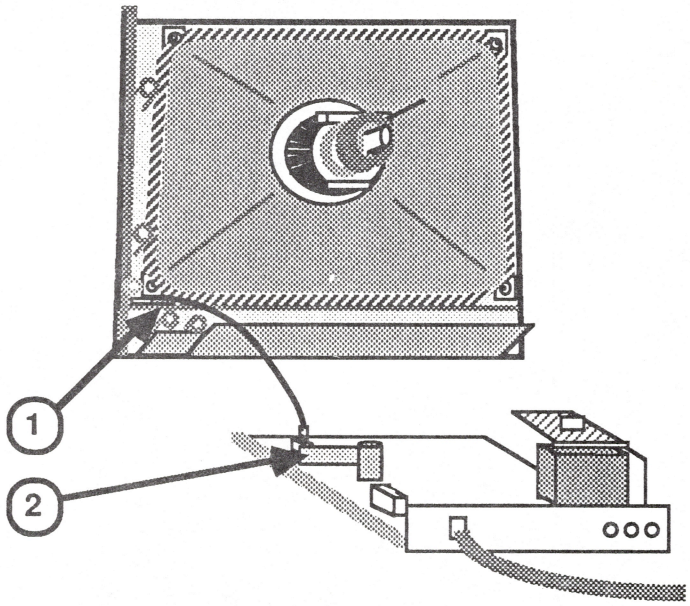

FIGURE 14

10. Disconnect the on/off switch from its bracket.

    For the IIe:

    a. Remove the two screws* that secure the on/off switch bracket to the front bezel (Figure 12, #1).

    b. Pull the switch button* off its shaft.

    c. Remove the two screws* securing the switch assembly to its mounting bracket.*

    For the IIc:

    a. Pull the switch button* (Figure 13, #1) off its shaft.

    b. Remove the screw* (Figure 13, #2) which secures the on/off switch to the plastic bracket.*

11. For the IIe or IIc, Rev. A only:

    Disconnect the LED cable (Figure 14, #1) from the small, vertically mounted video PCB attached to the main logic PCB (Figure 14, #2).

    For the IIe or IIc, Rev. B only:

    Disconnect the LED cable from the main logic PCB.

    NOTE: Rev. B monitors may be identified by the absence of a separate power supply board.

* Save these items for installation on the replacement logic board module. (See **WHAT TO KEEP** and **WHAT TO RETURN** on the next page.)

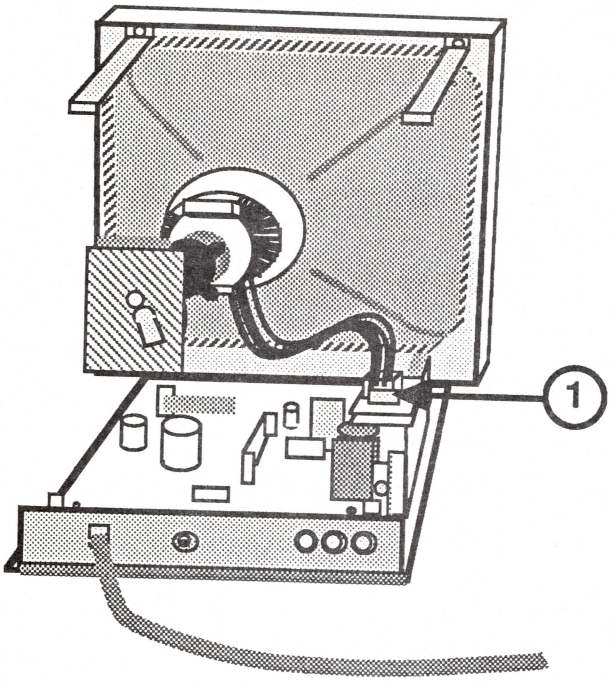

FIGURE 15

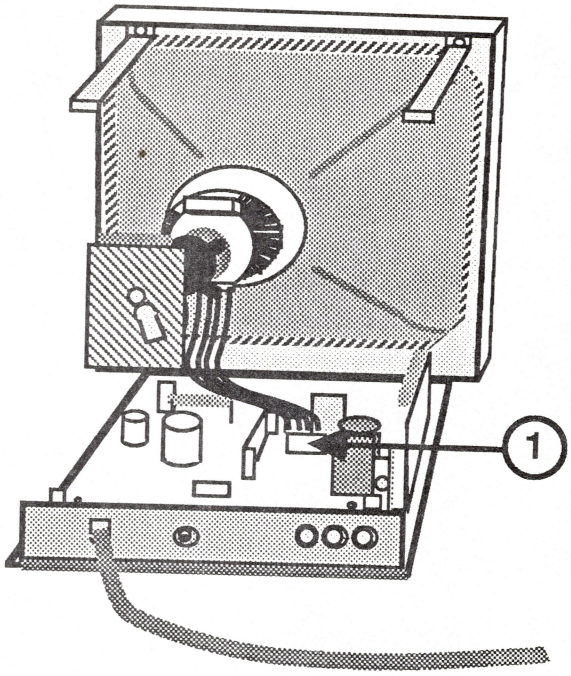

FIGURE 16

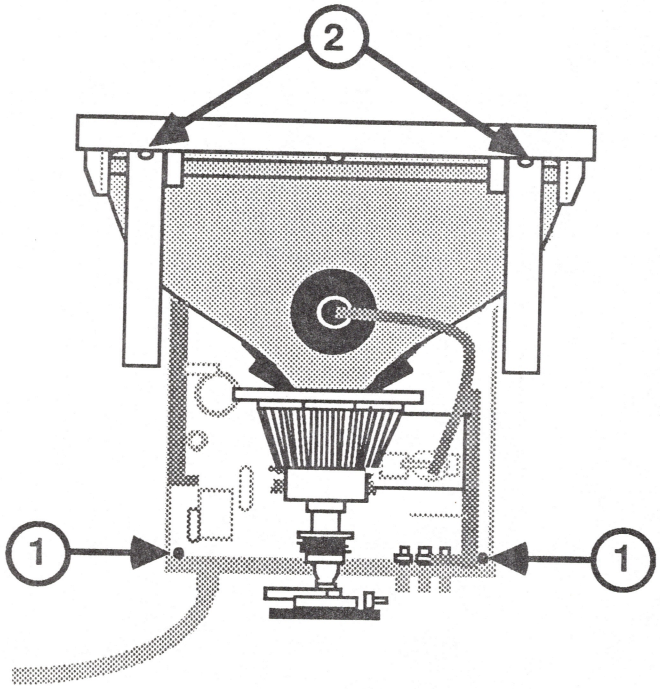

FIGURE 17

12. For the IIe or IIc, Rev. A only:
Disconnect the CRT connector (red/blue/yellow/green) from the power supply board (Figure 15, #1).

For the IIe or IIc, Rev. B only:
Disconnect the CRT connector (red/blue/yellow/green) from the logic board (Figure 16, #1).

13. Slide the main logic board assembly from under the CRT.

14. Remove the five front plastic control knobs.*

CAUTION: Be very careful with the fragile White Only switch (the elongated one). The mounting is easily broken, requiring replacement of the PCB. Use the fingers of one hand to hold the mounting down VERY SECURELY while you pull the switch button off its shank.

15. Remove the three rear control knobs* as follows:
    a. Remove the two screws* (Figure 17, #1) that secure the back panel to the main logic PCB.
    b. Carefully disengage the "teeth" on the bottom of the panel from the openings on the metal chassis.
    c. Taking care not to put tension on the AC power cord connection, move the right side of the rear panel away from the three plastic control knobs on the logic board.
    d. Remove the three rear plastic control knobs from the logic board.

16. For Rev. A only, remove the two screws* holding the two upper case support brackets* to the bezel (Figure 17, #2).

* Check below to determine which model- or color-specific items to keep with the customer's unit and which should be sent back to Apple.

WHAT TO KEEP: Keep the following items to install on the replacement main logic board assembly:
1. Removable rear panel (Rev. B only - see Figure 19)
2. Control knobs (five front, three rear, one power)
3. IIe metal on/off switch bracket
4. IIc plastic on/off switch bracket
5. All screws

WHAT TO RETURN: The following items **MUST** be returned to Apple with the logic board:
1. Uninsulated IIe upper case support brackets (Rev. A only)
2. IIe extension bracket (located between the IIe main logic board and the control PCB)

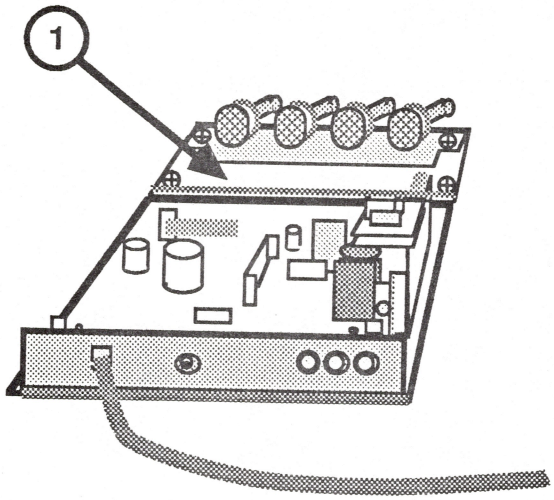

FIGURE 18

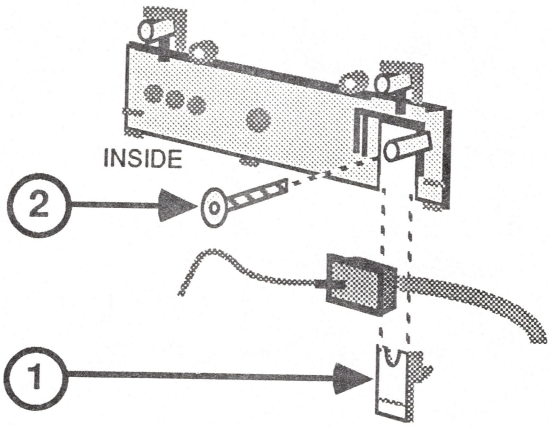

FIGURE 19

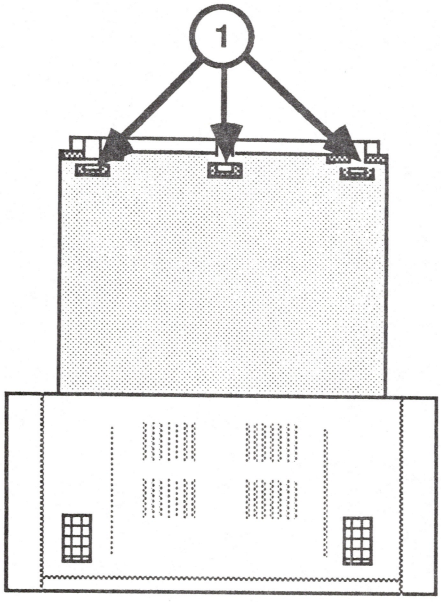

FIGURE 20

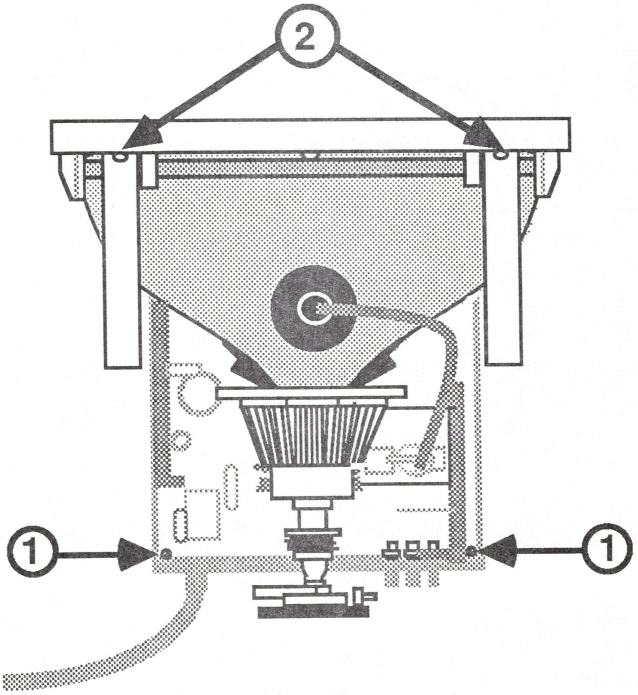

FIGURE 21

REPLACING THE MAIN LOGIC PCB - Series "H"

NOTE: If you are installing a replacement main logic PCB module in the ColorMonitor IIe, you must first install an extension bracket between the main logic PCB and the control PCB. (This ensures size compatibility between the entire main logic PCB assembly and the monitor housing.) The extension bracket (with hardware) is included in all Main Logic Board Assembly spares modules. Install the bracket as shown in Figure 18, #1. Then continue to the steps below.

(If you are replacing the main Logic PCB of the ColorMonitor IIc, the bracket is not needed. Return it to Apple with the defective logic board assembly.)

1. Place the customer's three plastic control knobs over the adjustment pots at the back of the main logic PCB module.

2. From the logic board replacement kit, select the appropriately colored rear panel (to match the unit you are repairing) and fit the panel over the AC power cord (Figure 19). Slide the matching small plastic holding piece under the cord, as shown (Figure 19, #1) until it fits securely under the power cord.

3. Replace the screw that holds the power cord in place (Figure 19, #2).

4. Fit the rear panel over the three rear control knobs, making sure the plastic "teeth" on the bottom of the panel fit into the openings in the metal chassis (Figure 20, #1).

5. Replace the two screws (Figure 21, #1) that secure the back panel to the main logic PCB.

6. If you are repairing a Rev. A monitor, install the two new **INSULATED** upper case supports you will find in the logic board replacement kit. To do this, replace the two screws that secure the upper case supports to the top of the bezel (Figure 21, #2).

   WARNING: THESE INSULATED BRACKETS MUST BE INSTALLED WHENEVER YOU PLACE A REV. B LOGIC BOARD SERVICE MODULE IN A REV. A MONITOR CHASSIS. FAILURE TO DO SO CAN RESULT IN A POSSIBLE ELECTROSHOCK HAZARD FOR THE USER.

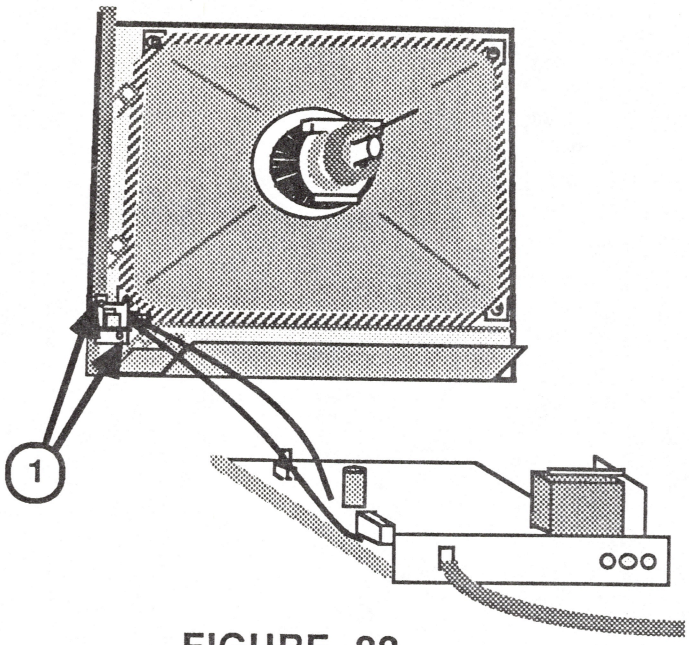

FIGURE 22

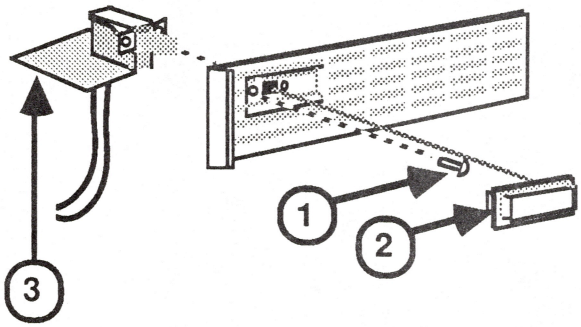

FIGURE 23

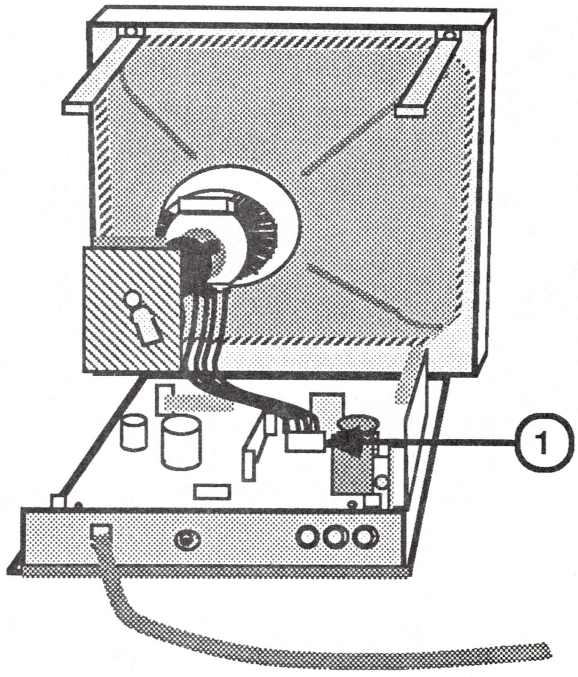

FIGURE 24

7. Replace the customer's five front plastic control knobs on the logic board adjustment pots.

8. With the front bezel (with CRT) on its feet, slide the main logic board under the CRT neck about three inches away from the base of the CRT.

9. Reconnect the on/off switch:

   For the IIe:
   a. Replace the two screws securing the switch assembly to its mounting bracket.
   b. Replace the customer's switch button on its shaft.
   c. Replace the two screws which secure the on/off switch to the front bezel (Figure 22, #1).

   For the IIc:
   a. Replace the screw (Figure 23, #1) which secures the on/off switch to the plastic bracket. The small switch PCB (Figure 23, #3) is on the bottom as you insert the switch unit into the plastic bracket.
   b. Replace the customer's switch button (Figure 23, #2) on its shaft.

10. For the IIe or IIc, Rev. A service module only:
Reconnect the CRT connector (red/blue/yellow/green) to the power supply board.

   For the IIe or IIc, Rev. B service module only:
Reconnect the CRT connector (red/blue/yellow/green) to the logic board (Figure 24, #1).

   CAUTION: Be sure that this and all connector wires are placed under the CRT neck.

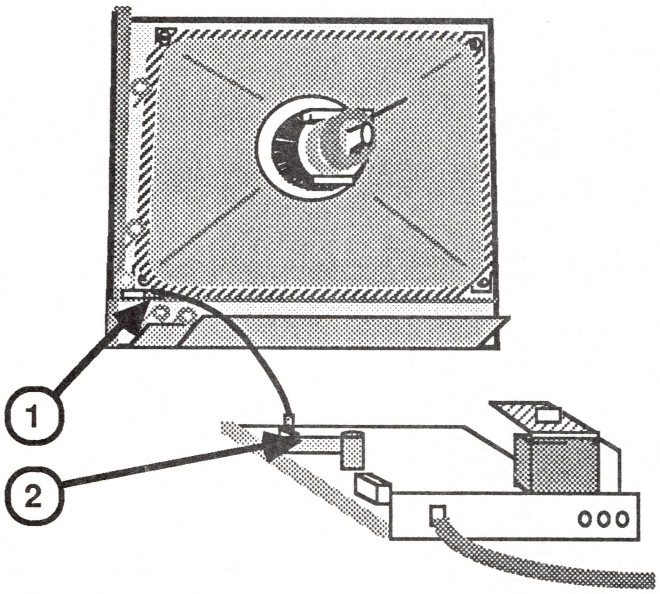

FIGURE 25

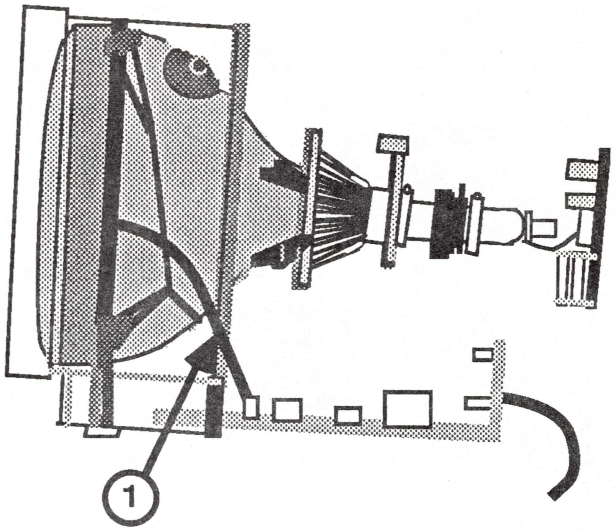

FIGURE 26

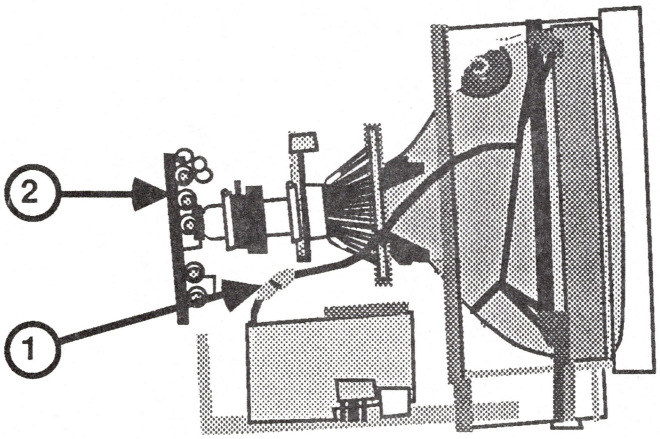

FIGURE 27

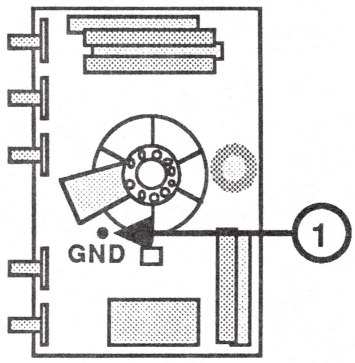

FIGURE 28

11. Reconnect the LED as directed below.

    For the IIe or IIc, Rev. A service module only:
    Reconnect the LED cable (Figure 25, #1) to the small, vertically mounted video PCB attached to the main logic PCB (Figure 25, #2).

    For the IIe or IIc, Rev. B service module only:
    Reconnect the LED cable to the main logic PCB.

    NOTE: If you have replaced a faulty Rev. A logic board with a Rev. B service module (or vice versa), the LED will not work because the polarity of the LED circuitry was reversed when the board was redesigned. The problem can be corrected by reversing the leads on the LED. For directions, see "LED Polarity Reversal Procedure - Series H" in **Section 0, Service Notes.**

12. Slide the main logic PCB into the front bezel so that the control knobs fit through the holes in the front of the unit. (**In order for the main logic assembly to now fit into the IIe bezel, you must have installed the extension bracket, as directed in the NOTE at the beginning of this procedure.**)

13. Reconnect the degaussing coil ground strap to connector W on the main logic PCB (Figure 26, #1), making sure the "W" on the side of the connector is matched to the "W" on the logic board.

14. Reconnect the white CRT ground strap at its plug-in connector (Figure 27, #1).

15. Reconnect the gray CRT ground strap to the CRT socket board (Figure 28, #1).

16. Reconnect the CRT socket board to the CRT neck (Figure 27, #2). It fits only one way.

17. Replace the anode cap. (See "Discharging the Cathode Ray Tube.")

18. Replace the rear cover. (See "Replacing the Rear Cover.")

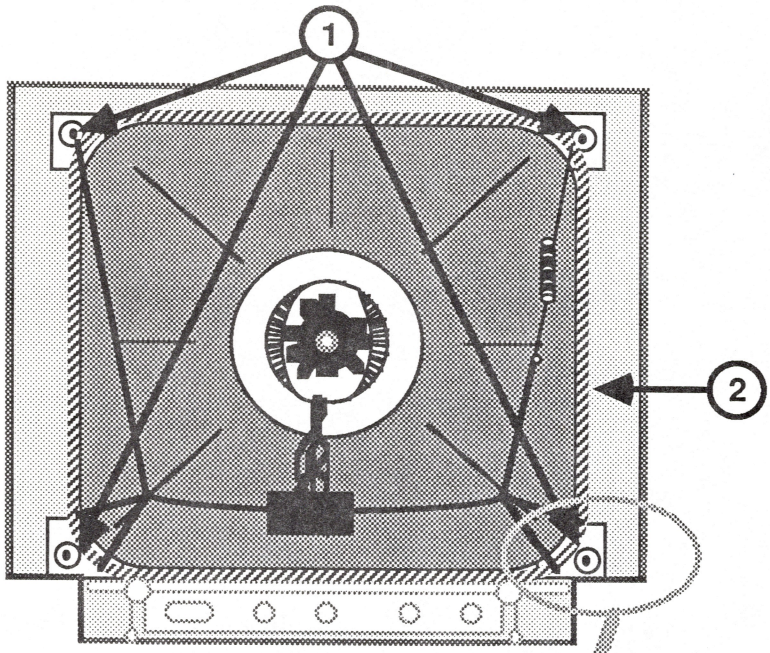

FIGURE 29

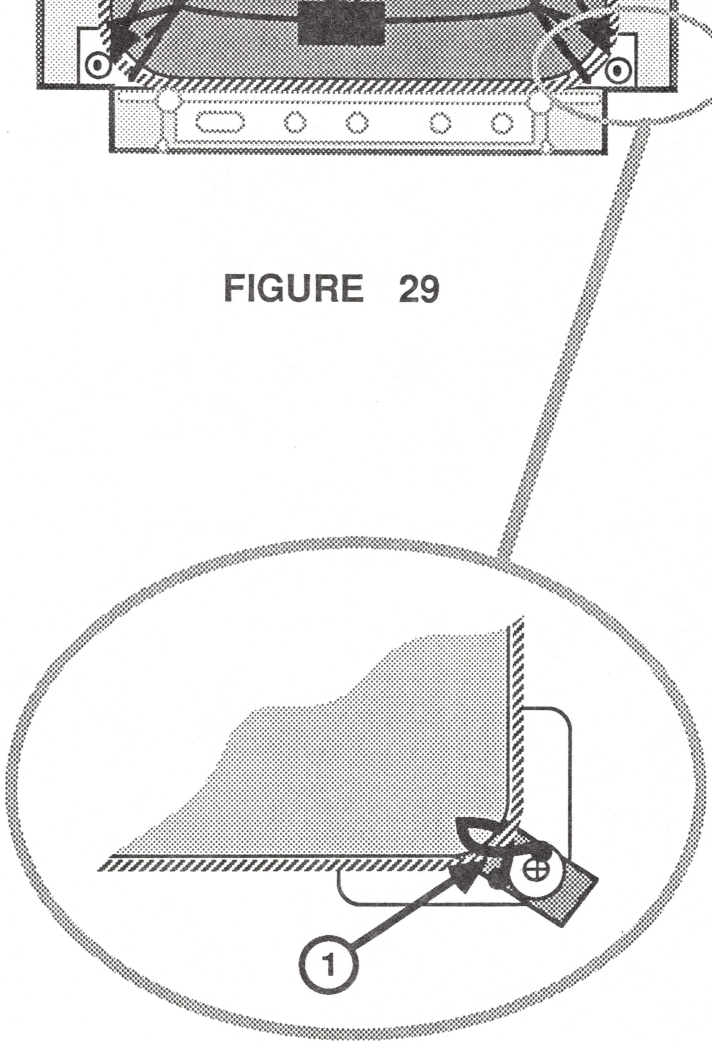

FIGURE 30

REMOVING THE CATHODE RAY TUBE (CRT) - Series "H"

1. Turn off the monitor and disconnect the AC cord.
2. Remove the rear cover. (See "Removing the Rear Cover.")
3. **DISCHARGE THE CRT.** (See "Discharging the Cathode Ray Tube.")
4. Remove the logic board. (See "Removing the Main Logic PCB.")
5. Place the monitor face down on a protective pad.
6. Unscrew the four CRT mounting screws (Figure 29, #1).
7. Carefully lift the CRT/degaussing coil assembly out of the front bezel. On the IIc, the degaussing coil (Figure 29, #2) is mounted to the CRT with plastic holding tabs (Figure 30, #1). On the IIe, the degaussing coil is mounted inside the bezel and must be removed separately (after the CRT is removed).

WARNING: IF YOU INTEND TO DISPOSE OF THE CRT, REFER TO "Disposing of the Cathode Ray Tube" IN SECTION 1.

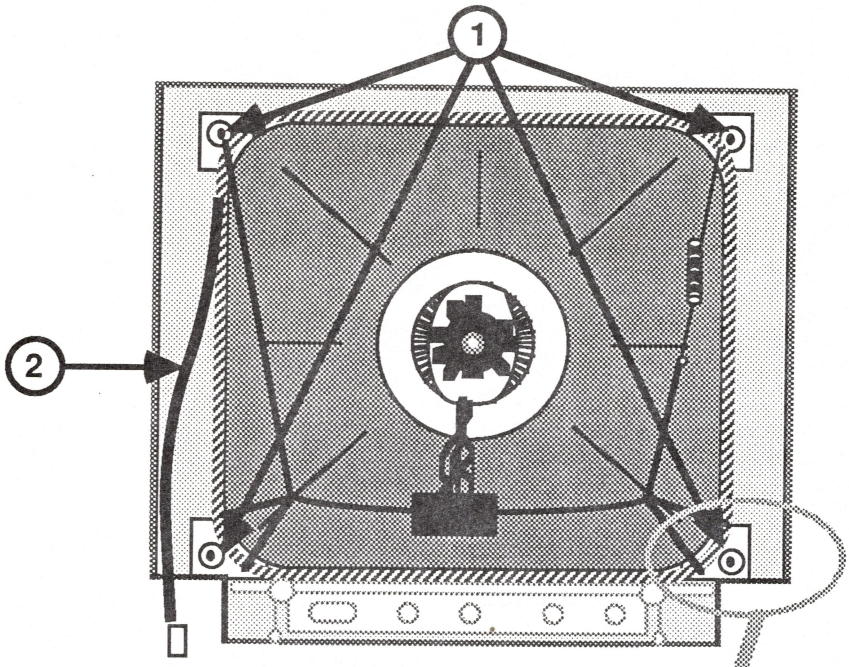

FIGURE 31

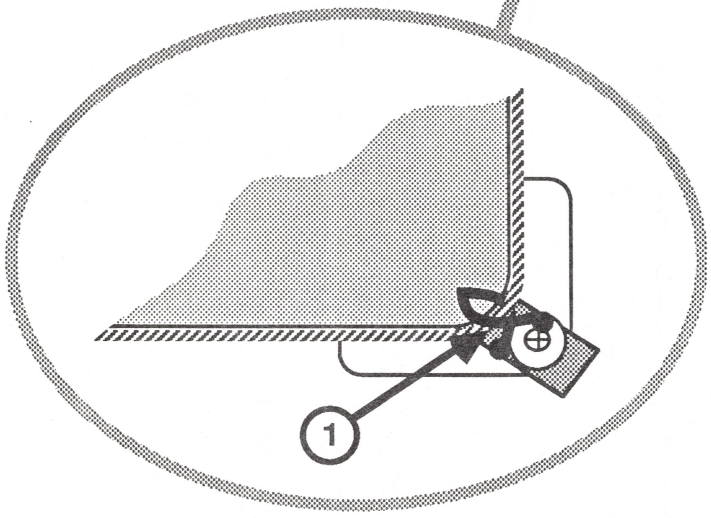

FIGURE 32

REPLACING THE CATHODE RAY TUBE (CRT) - Series "H"

1. Place the front bezel face down on a clean, soft surface.

2. Replace the LED assembly. (See "Replacing the LED Assembly.")

3. Replace the CRT/degaussing coil assembly:

   On the IIc:

   Carefully place the entire CRT/degaussing coil assembly into the front bezel, making sure the degaussing coil ground strap (Figure 31, #2) is on the left side as you face the back of the monitor.

   On the IIe:

   Place the degaussing coil around the inside front of the bezel, making sure the degaussing coil ground strap is on the left side as you face the back of the monitor. Then carefully set the CRT into the front bezel, over the degaussing coil. The degaussing coil will no longer be visible.

4. Tighten the four CRT mounting screws (Figure 31, #1) through the mounting brackets at the corners of the CRT. On the IIc, make sure each screw is also positioned through the plastic holding tabs (Figure 32, #1).

5. Replace logic board. (See "Replacing the Main Logic PCB.")

6. Replace the rear cover. (See "Replacing the Rear Cover.")

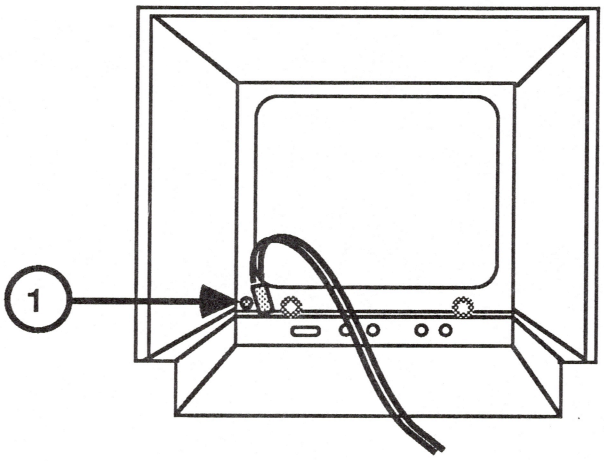

FIGURE 33

REMOVING THE LED ASSEMBLY (IIc ColorMonitor only) - Series "H"

1. Turn off the monitor and disconnect the AC cord.
2. Remove the rear cover. (See "Removing the Rear Cover.")
3. **DISCHARGE THE CRT.** (See "Discharging the Cathode Ray Tube.")
4. Remove the main logic PCB. (See "Removing the Main Logic PCB.")
5. Remove the Cathode Ray Tube (CRT). (See "Removing the Cathode Ray Tube.")
6. Remove the screw (Figure 33, #1) that secures the plastic bracket of the LED assembly to the front bezel.

REPLACING THE LED ASSEMBLY (IIc ColorMonitor only) - Series "H"

1. Replace the screw (Figure 33, #1) that holds the LED assembly in place inside the front bezel.
2. Replace the Cathode Ray Tube (CRT). (See "Replacing the Cathode Ray Tube.")
3. Replace the main logic PCB. (See "Replacing the Main Logic PCB.")
4. Replace the rear cover. (See "Replacing the Rear Cover.")

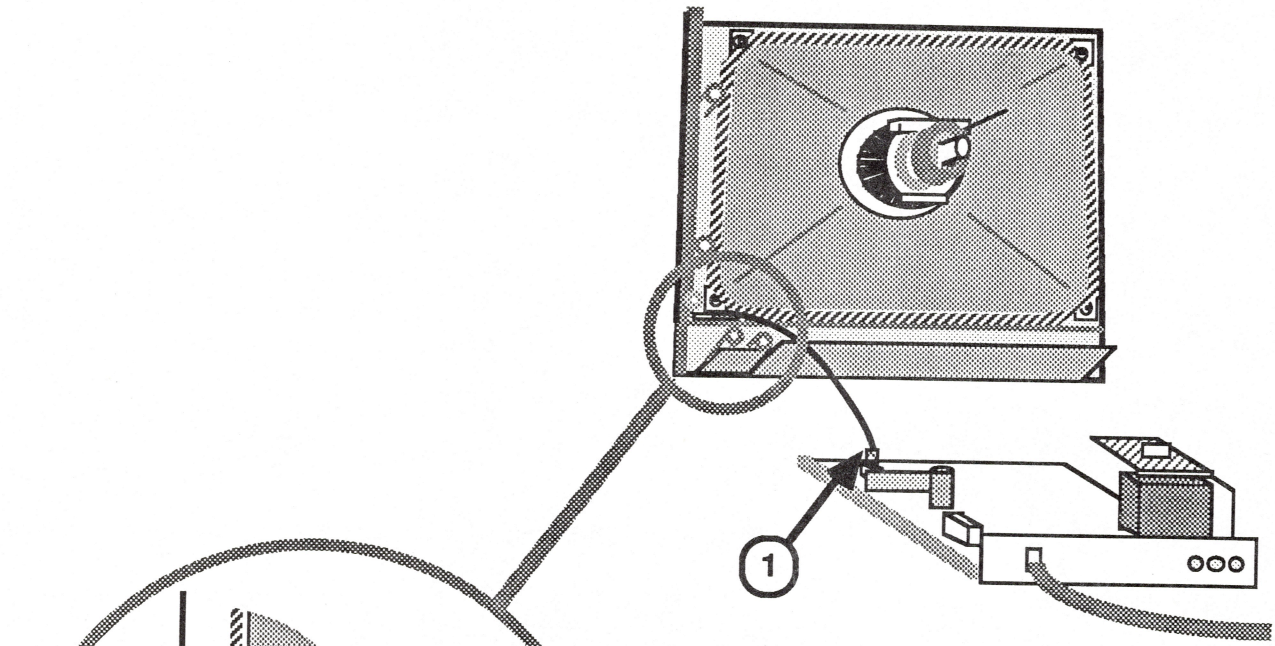

FIGURE 34

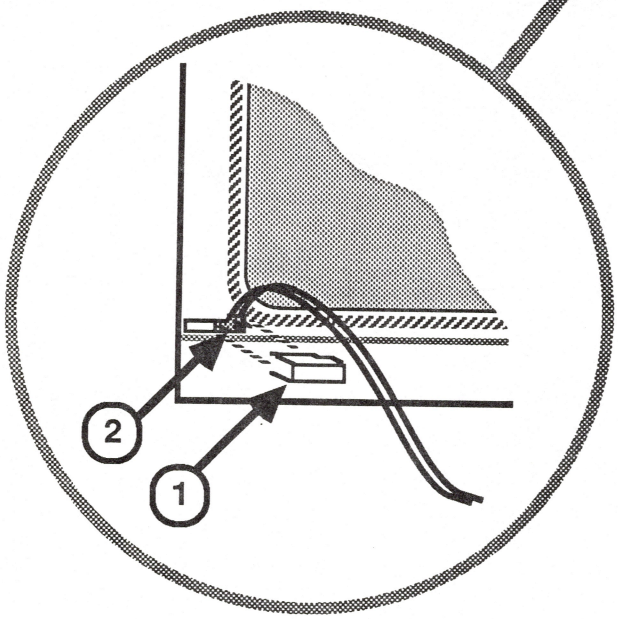

FIGURE 35

REMOVING THE LED ASSEMBLY (IIe ColorMonitor only) - Series "H"

1. Turn off the monitor and disconnect the AC cord.

2. Remove the rear cover. (See "Removing the Rear Cover.")

3. **DISCHARGE THE CRT.** (See "Discharging the Cathode Ray Tube.")

4. For Rev. A only:
   Disconnect the LED cable from the small, vertically mounted video PCB attached to the main logic PCB (Figure 34, #1).

   For Rev. B only:
   Disconnect the LED cable from the main logic PCB.

5. Pull off the clear plastic cap (Figure 35, #1) that secures the LED to the front bezel.

6. Pull the LED free from the front bezel.

REPLACING THE LED ASSEMBLY (IIe ColorMonitor only) - Series "H"

1. Position the LED assembly in its appropriate place inside the front bezel (Figure 35, #2).

2. Replace the clear plastic cap (Figure 35, #1) that secures the LED to the front bezel.

3. For Rev. A only:
   Reconnect the LED cable to the small, vertically mounted video PCB attached to the main logic PCB (Figure 34, #1).

   For Rev. B only:
   Reconnect the LED cable to the main logic PCB.

   NOTE: The polarity of the LED circuitry on the ColorMonitor IIe, Series H, Rev. B, is reversed from that of Rev. A. This means that LEDs designed to work with Rev. A logic boards will not work with Rev. B logic boards. After you have reconnected the LED to the main logic board, power on the monitor to ensure that the LED lights. If it does not, reverse the leads of the LED. (See "LED Polarity Reversal Procedure - Series H" in **Section 0, Service Notes.**)

4. Replace the rear cover. (See "Replacing the Rear Cover.")

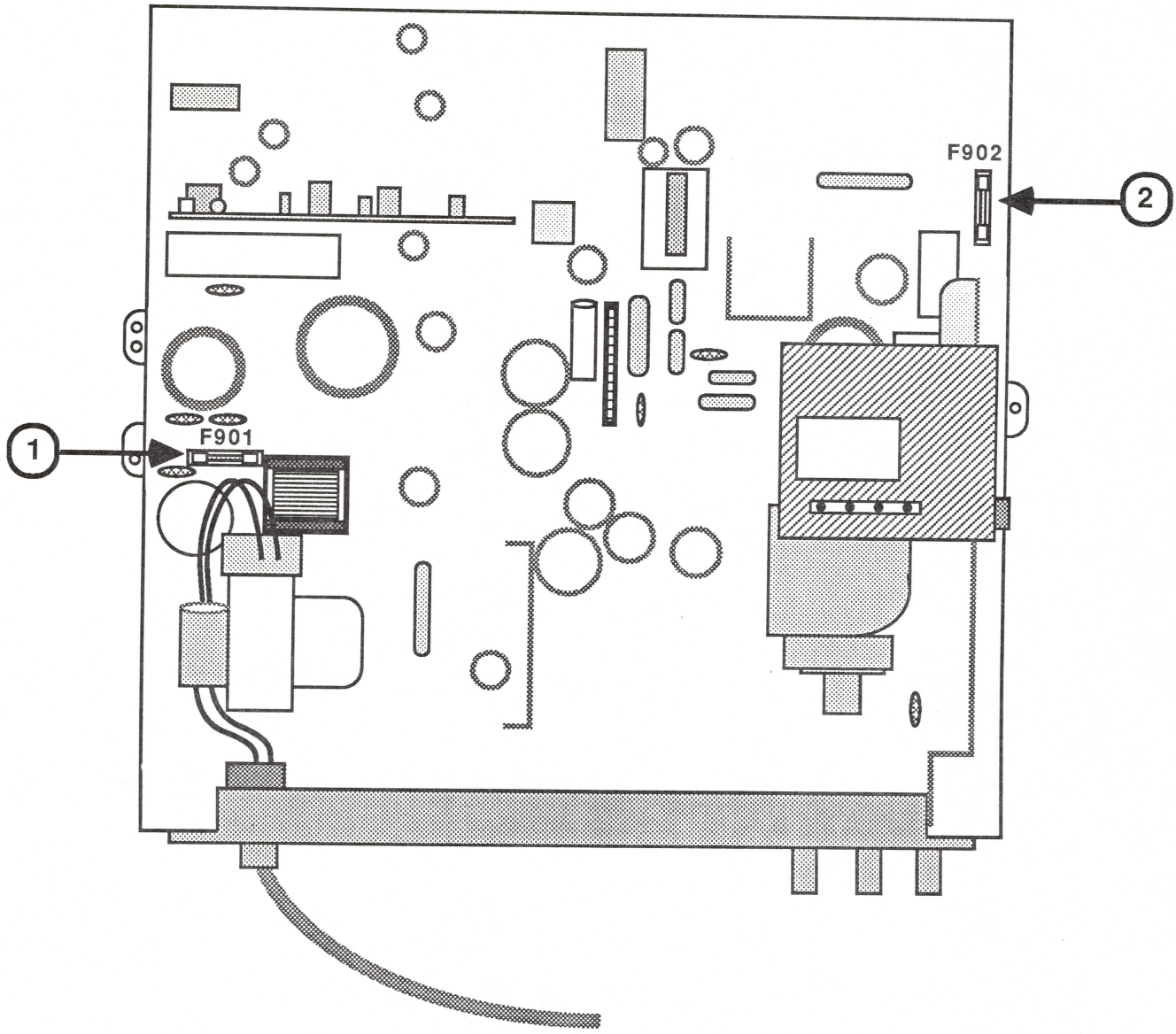

FIGURE 36

REPLACING THE LOGIC BOARD FUSES (F901 and F902) - Series "H"

Both fuses are mounted to the component side of the main logic PCB (Figure 32).

1. Disconnect the AC power cord.

2. Remove the rear cover. (See "Removing the Rear Cover.")

3. **DISCHARGE THE CRT.** (See "Discharging the Cathode Ray Tube.")

4. **Check fuse F901 to see whether you need to perform the Fuse Upgrade Procedure.**

   a. Carefully remove fuse F901 (Figure 36, #1) by prying at one metal end, then the other, to remove the fuse from the fuse holder.

      CAUTION: DO NOT TRY TO SLIDE THE FUSE SIDEWAYS. YOU MAY BREAK THE FUSE HOLDER.

   b. If the F901 fuse is a 3.15 Amp 250 V fuse, **you must perform the Upgrade Procedure before continuing, (see Section 0, Service Notes). The Upgrade Procedure replaces the 3.15 Amp 250 V fuse with a 4 Amp 125V fuse.**

   c. If a 4 Amp 125V fuse has already been installed, check to see that it is good. If it is not, replace it with a new 4 Amp 125 V fast blow fuse.

5. Now check fuse F902 (Figure 36, #2). If it is burned out, replace it with a 1 Amp Fast Blow fuse.

6. Replace the rear cover. (See "Replacing the Rear Cover.")

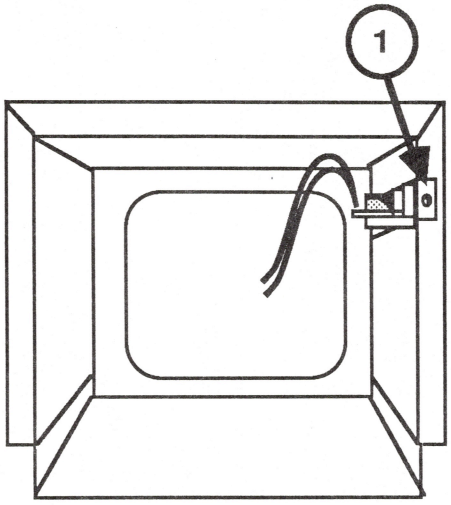

FIGURE 37

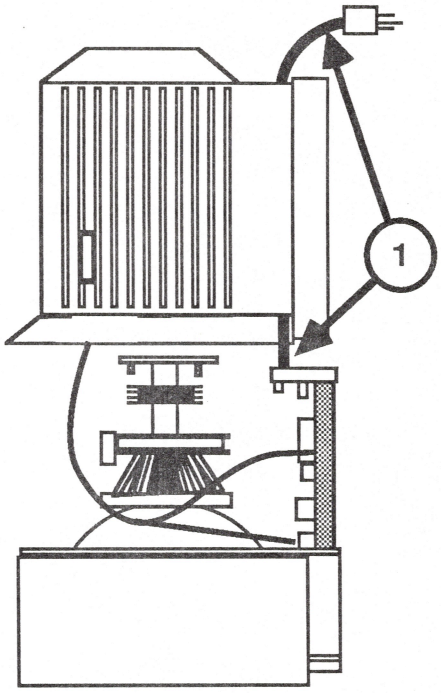

FIGURE 38

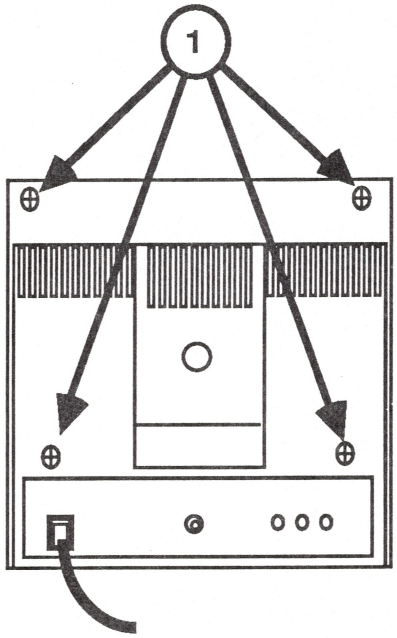

FIGURE 39

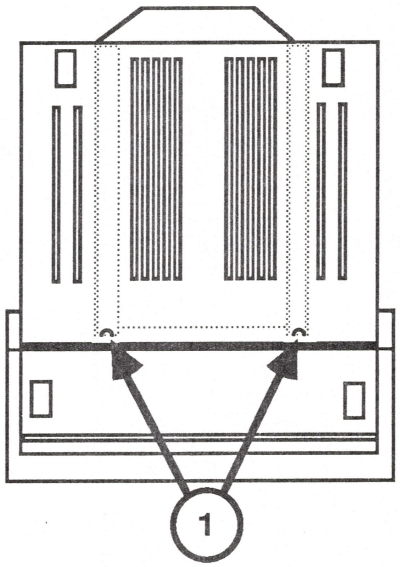

FIGURE 40

REPLACING THE REAR COVER (IIc ColorMonitor only) - Series "H"

1. Replace the screw which holds the on/off switch bracket to the rear cover (Figure 37, #1).

2. Orient the rear cover and monitor as shown in Figure 38; the monitor is face down.

3. Guide the AC power cord through the opening in the rear cover while you lower the cover onto the monitor (Figure 38, #1).

4. Replace the four screws (Figure 39, #1) at the back of the monitor.

5. Replace the two screws (Figure 40, #1) at the bottom of the monitor.

6. Set the monitor back on its feet.

7. Run the monitor tests on the Apple II Peripherals Diskette (or equivalent) to verify that the monitor is functioning properly. Equivalent diagnostics are those that generate color bars or test patterns and can thus verify the monitor's color operation.

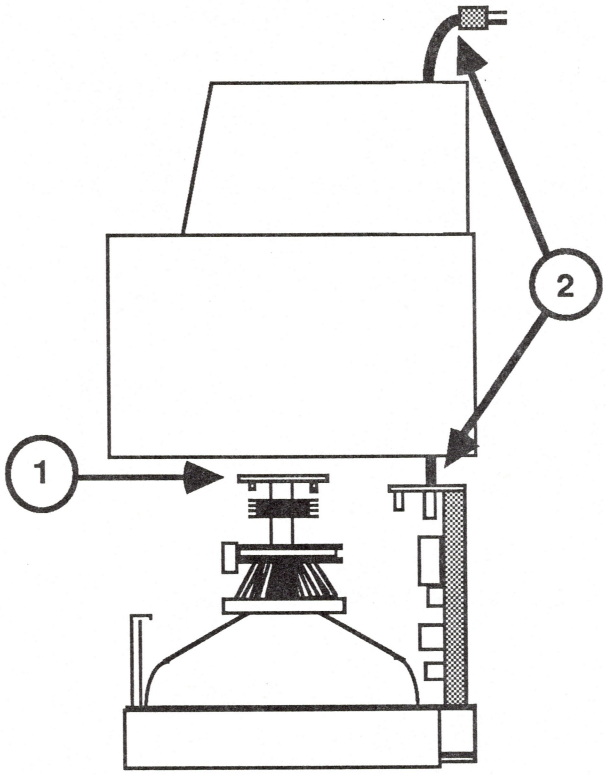

FIGURE 41

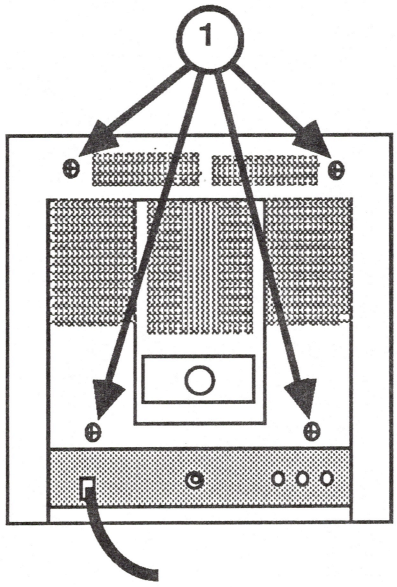

FIGURE 42

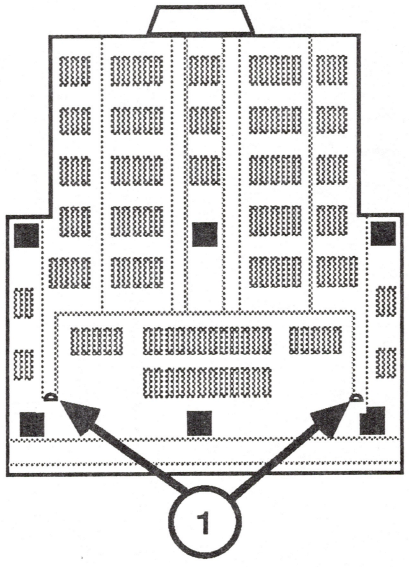

FIGURE 43

REPLACING THE REAR COVER (IIe ColorMonitor only) - Series "H"

1. Orient the rear cover and monitor as shown in Figure 41; the monitor is face down.

2. Guide the AC power cord (Figure 41, #1) through the opening in the cover while you lower the cover onto the monitor.

3. Replace the four screws (Figure 42, #1) at the back of the monitor.

4. Replace the two screws (Figure 43, #1) at the bottom of the monitor.

5. Run the monitor tests on the Apple II Peripherals Diskette (or equivalent) to verify that the monitor is functioning properly. Equivalent diagnostics are those that generate color bars or test patterns and can thus verify the monitor's color operation.

Apple ColorMonitor IIe/IIc
Technical Procedures

Section 4

Adjustments

Contents:

Introduction.....4.3
Text (Black & White) Adjustments.....4.5
Color Adjustments
  Materials Needed.....4.7
  Adjustment Procedure Series "S".....4.7
  Adjustment Procedure Series "H".....4.11

WARNING: The Series "H" Rev. B monitor and service module have an "AC/DC transformerless" design -- that is, there is no isolation transformer on the AC power circuit, and the chassis is connected to the neutral line. With such designs, IF THE POWER PLUG IS INSERTED BACKWARDS INTO THE OUTLET (OR IF THE OUTLET IS WIRED BACKWARDS) THE CHASSIS CARRIES A LETHAL CURRENT.

Use only a three-prong grounded electrical outlet installed by a qualified electrician, and do not under any circumstances use an adaptor plug. FOR YOUR SAFETY, APPLE URGES YOU TO USE AN ISOLATION TRANSFORMER BETWEEN THE MONITOR AND THE ELECTRICAL OUTLET.

DO NOT ATTEMPT TO MAKE ANY ADJUSTMENTS ON THE REV. B MONITOR OTHER THAN THOSE DIRECTED HEREIN, AND DO THOSE WITH EXTREME CAUTION!!!

The Series "H" Rev. B monitors and service modules may be identified by the absence of a separate power supply board.

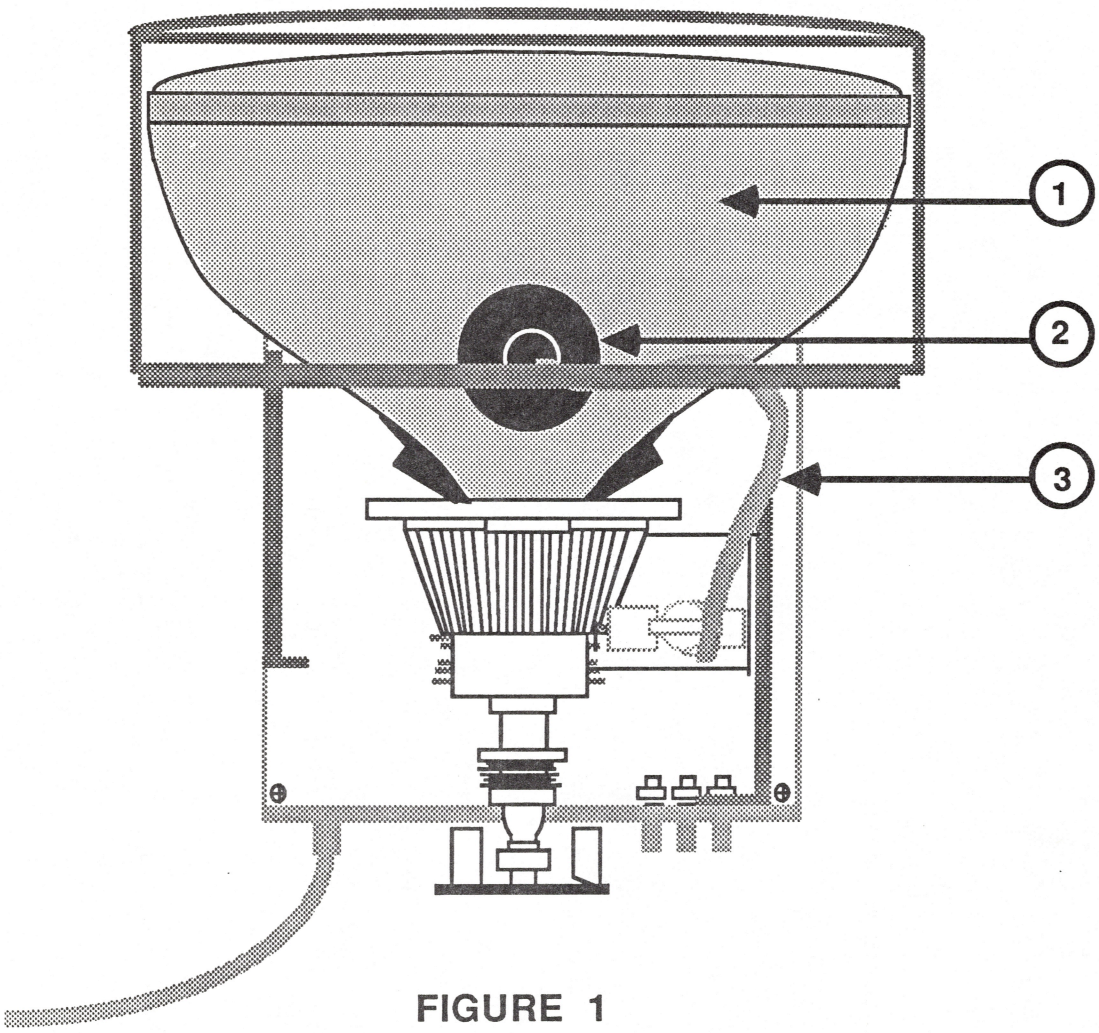

FIGURE 1

INTRODUCTION

The ColorMonitor IIe/IIc has two modes of operation - text and color. In exceptional circumstances one or both modes may need adjustment following the replacement of the main logic PCB or other modules. After any such service, check the text and color production by viewing any program(s) generating text (black & white) and color.

DO NOT CHANGE THE INTERNAL COLOR ADJUSTMENTS IF THE COLOR PRODUCTION IS WITHIN ACCEPTABLE RANGE! Perfect color adjustments require special equipment. The color adjustments given in this section will only allow you to achieve an acceptable level of color production in those rare cases where adjustment is necessary.

All yoke adjustments have been preset by the manufacturer. Do not attempt to make any tilt, ring, or geometric adjustments on the ColorMonitor. If the customer's monitor exhibits adjustment problems which cannot be corrected using the following procedures, use the procedures found in the "Troubleshooting" section to isolate the faulty module, and return that module to Apple for repair.

The Apple II Peripherals Diskette

The Apple II Peripherals Diskette contains test patterns you can use when making adjustments to this or any monitor. The monitor test patterns generated include:

Dot Pattern	40 Column Display	Color Bars
Grid Pattern	80 Column Display	Full White Screen

When a monitor needs adjustment, begin by adjusting the text display, then adjust the color (graphics) display.

WARNING !!!

THERE ARE EXTREMELY HIGH VOLTAGES ON THE TUBE, THE ANODE, THE ANODE LEAD, AND IN THE POWER SUPPLY AREA. DURING THESE ADJUSTMENTS YOU WILL BE PUTTING YOUR HAND NEAR THESE HIGH VOLTAGE PARTS WHILE THE POWER IS ON. WATCH WHAT YOU ARE TOUCHING WHILE MAKING THESE ADJUSTMENTS. AVOID TOUCHING THE TUBE, ANODE, OR ANODE LEAD (FIGURE 1, #1, #2, AND #3), OR THE POWER SUPPLY AREA. USE ONLY ONE HAND TO MAKE ALL ADJUSTMENTS! NEVER HOLD THE CHASSIS WITH YOUR FREE HAND WHILE MAKING ADJUSTMENTS.

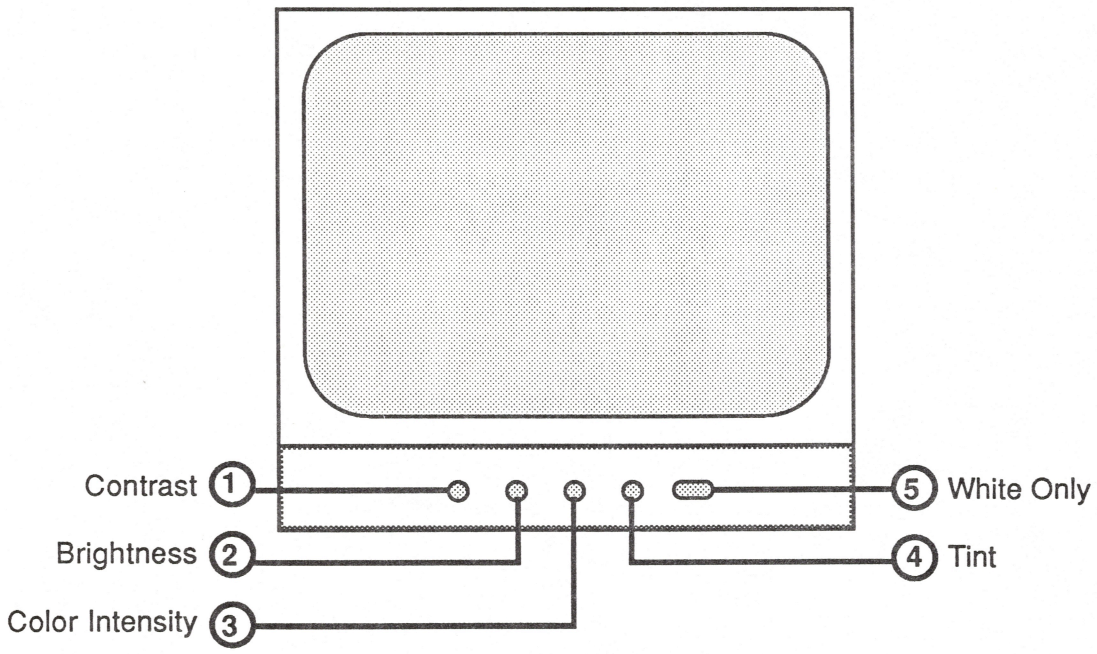

FIGURE 2

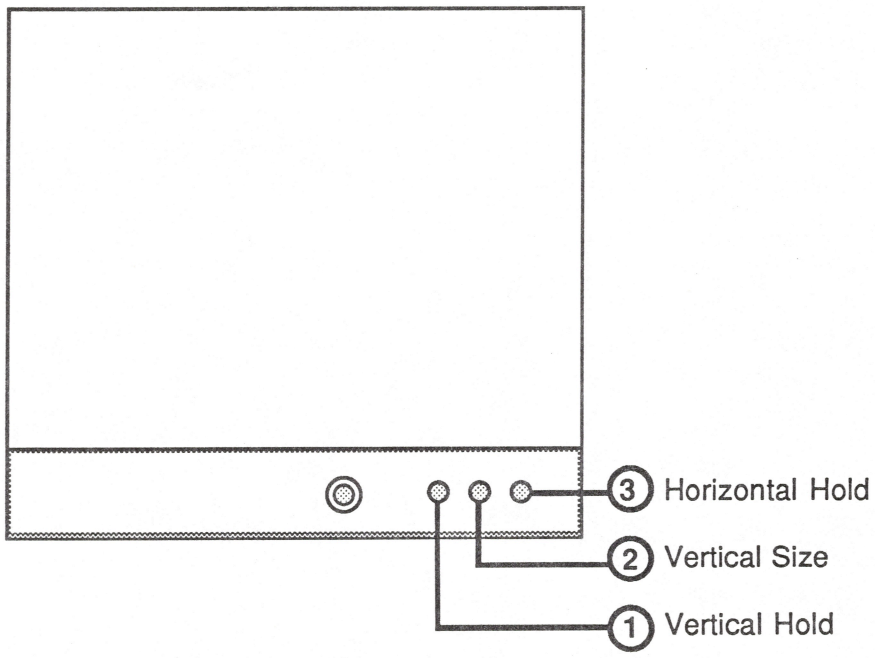

FIGURE 3

TEXT (BLACK AND WHITE) ADJUSTMENTS

Series "S" and Series "H"

Text adjustments are identical for Series "S" and Series "H" monitors. All text adjustment controls are located on the front and rear panels of the monitor and thus are accessible to both the dealer and the customer.

1. Connect the video cable and the power cords of the monitor and the IIc or IIe computer. Load the Apple II Peripherals Diskette into the computer and turn on the computer and the monitor. (**NOTE:** Any program that generates a 40 or 80 column text display may be used in place of the Peripherals Diskette.)

2. Select "Monitor Tests" from the program's main menu.

3. Select "40 Column Display" or "80 Column Display" from the monitor menu.

4. Open the access door on the lower front of the monitor.

5. Turn the **BRIGHTNESS** control (Figure 2, #2) to adjust the visibility of the screen to room lighting conditions.

6. Rotate the **CONTRAST** control (Figure 2, #1) to achieve a good balance between character brightness and screen background.

   NOTE: The **COLOR INTENSITY** control (Figure 2, #3), the **TINT** control (Figure 2, #4), and the **WHITE ONLY** switch (Figure 2, #5) have no effect on the text display.

7. Locate the **VERTICAL HOLD** control on the back panel of the monitor (Figure 3, #1). If the picture is moving vertically, turn the control until the picture becomes stable.

8. If the picture looks stretched, so that the characters on the top and bottom lines are partially lost, or if the characters look squashed, turn the **VERTICAL SIZE** control (Figure 3, #2) until you have lengthened or shortened the picture to the desired degree.

9. If the picture is moving horizontally, turn the **HORIZONTAL HOLD** control (Figure 3, #3) until the picture becomes stable.

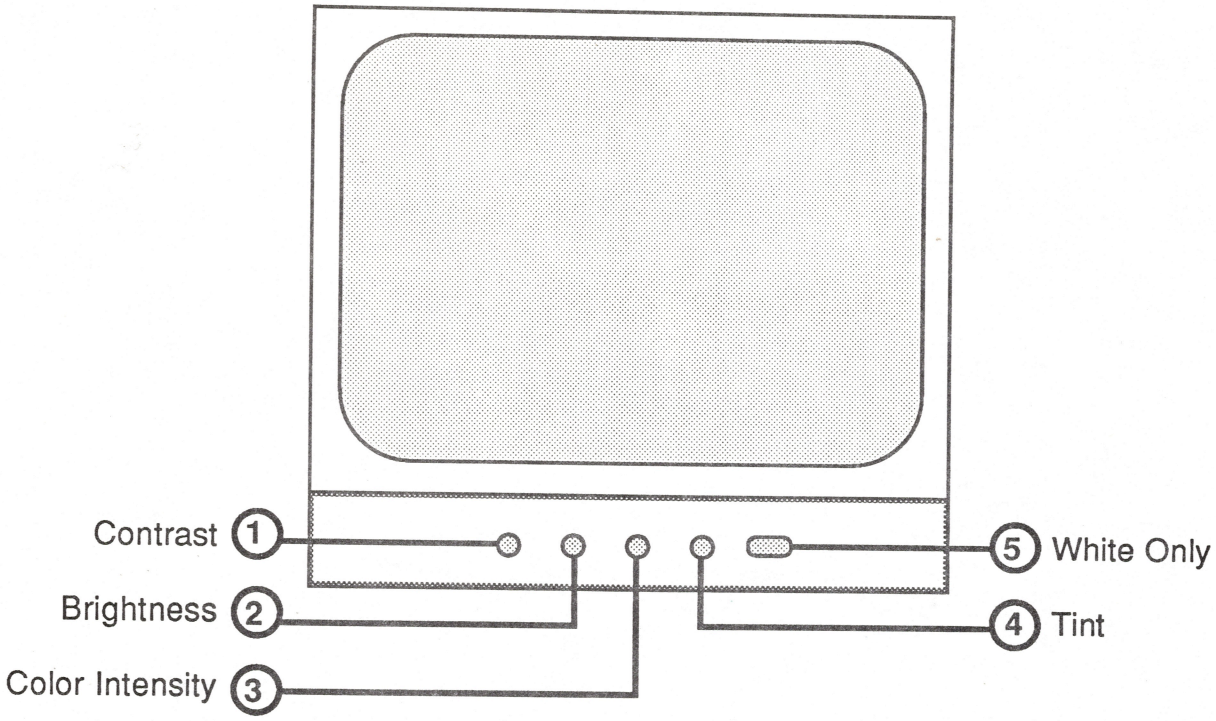

FIGURE 4

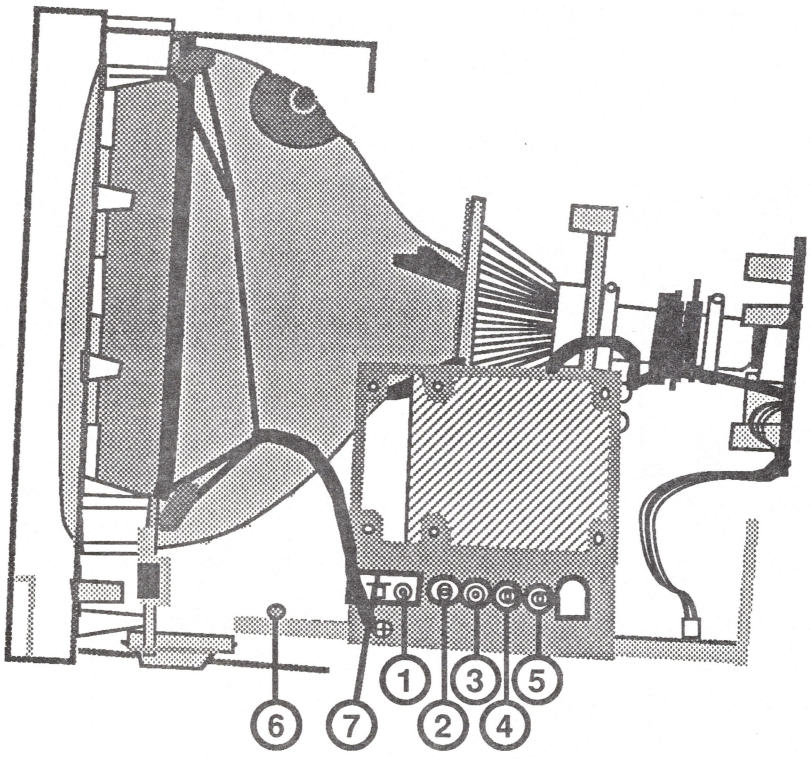

FIGURE 5

COLOR ADJUSTMENTS

Materials Needed

Apple ColorMonitor IIe/IIc
Apple IIe or IIc computer
Isolation transformer (for Series "H" Rev. B)
Apple II Peripherals Diskette
Small plastic flatblade screwdriver (tweaker)
   or plastic alignment tool
Mirror with prop (for viewing screen during adjustments)

Color Adjustment Procedure - Series "S"

1. Turn the monitor off and disconnect the power cord.

2. Disconnect the video cable from the back of the monitor.

3. Remove the rear cover. (See "Removing the Rear Cover" in the Series "S" Take-Apart section.)

4. Set the monitor on its feet, reconnect the power cord and video cable, and turn on the monitor and the computer.

5. Allow the monitor to warm up for at least 15 minutes.

6. Prop the mirror in front of the screen so that you can see the results of your adjustments as you work.

7. Turn the **COLOR INTENSITY** control (Figure 4, #3) on the front panel to its maximum counter-clockwise position.

8. Adjust the front panel **BRIGHTNESS** control (Figure 4, #2) to its detent (click) position.

9. Adjust the **CONTRAST** control (Figure 4, #1) to its maximum clockwise position.

10. Depress the **WHITE ONLY** switch (Figure 4, #5).

11. Locate the internal color controls behind the power supply board (Figure 5). **WARNING: THE POWER SUPPLY BOARD HAS EXTREMELY HIGH VOLTAGES. USE THE INSULATED TOOL IN ONE HAND ONLY, AND WATCH WHAT YOU ARE TOUCHING!**

12. Using the plastic alignment tool or insulated screwdriver, set the following controls to their mechanical centers:

    a. **R-DRIVE** (red) - Figure 5, #1

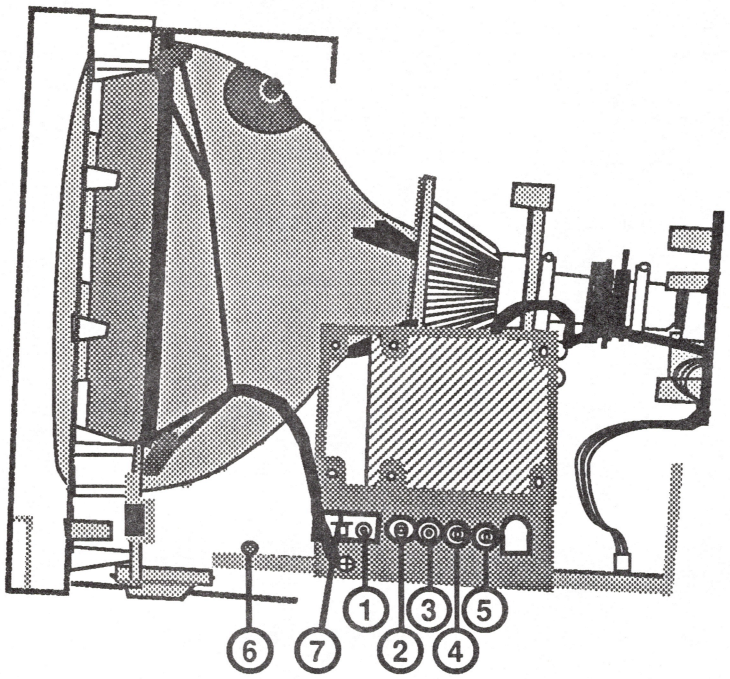

FIGURE 6

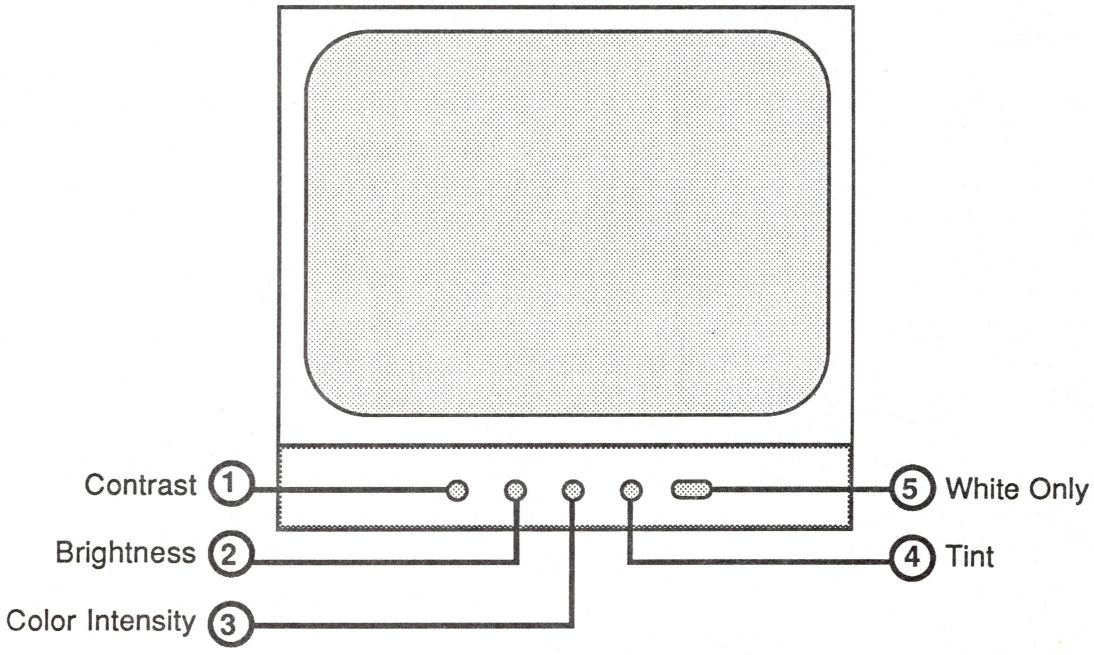

FIGURE 7

b. **B-DRIVE** (blue) - Figure 6, #2

c. **R-BIAS** (red) - Figure 6, #3

d. **G-BIAS** (green) - Figure 6, #4

e. **B-BIAS** (blue) - Figure 6, #5

f. **SUB-BRIGHTNESS** - Figure 6, #6

NOTE: To find mechanical center, turn the pot clockwise as far as possible, then counter-clockwise as far as possible. Mechanical center is exactly halfway between those two extremes.

13. Position the **SERVICE** switch (SW800) lever (Figure 6, #7) so that the lever points toward the picture tube at a 45° angle. The screen should now display a single horizontal line. Note the hue of the single horizontal line on the display screen. It must be adjusted so that it is white (neutral). No predominant color (red, blue, or green) should be visible. If the line is white, skip to step 16. However, if a predominant color is present within the horizontal line, proceed to step 14.

14. Make a slight counterclockwise adjustment to the **BIAS** control (red, green, or blue) that corresponds to the predominant color within the horizontal line.

15. Repeat step 14 until the horizontal line on the display screen is a neutral white.

16. Set the **SERVICE** switch (Figure 6, #7) back to its original position (with the lever pointing towards the back of the monitor).

17. Return the **WHITE ONLY** switch (Figure 7, #5) to its normal position (out).

18. Install the Apple II Peripherals Diskette into the drive and start up the program.

19. Select "Monitor Tests" from the main menu.

20. Select "Color Bars" from the monitor menu.

21. Adjust the **SUB-BRIGHTNESS** control (Figure 6, #6) so that the background on the display screen is black (no grain or grid is showing). Adjusting the **SUB-BRIGHTNESS** control in the clockwise direction increases the screen brightness level.

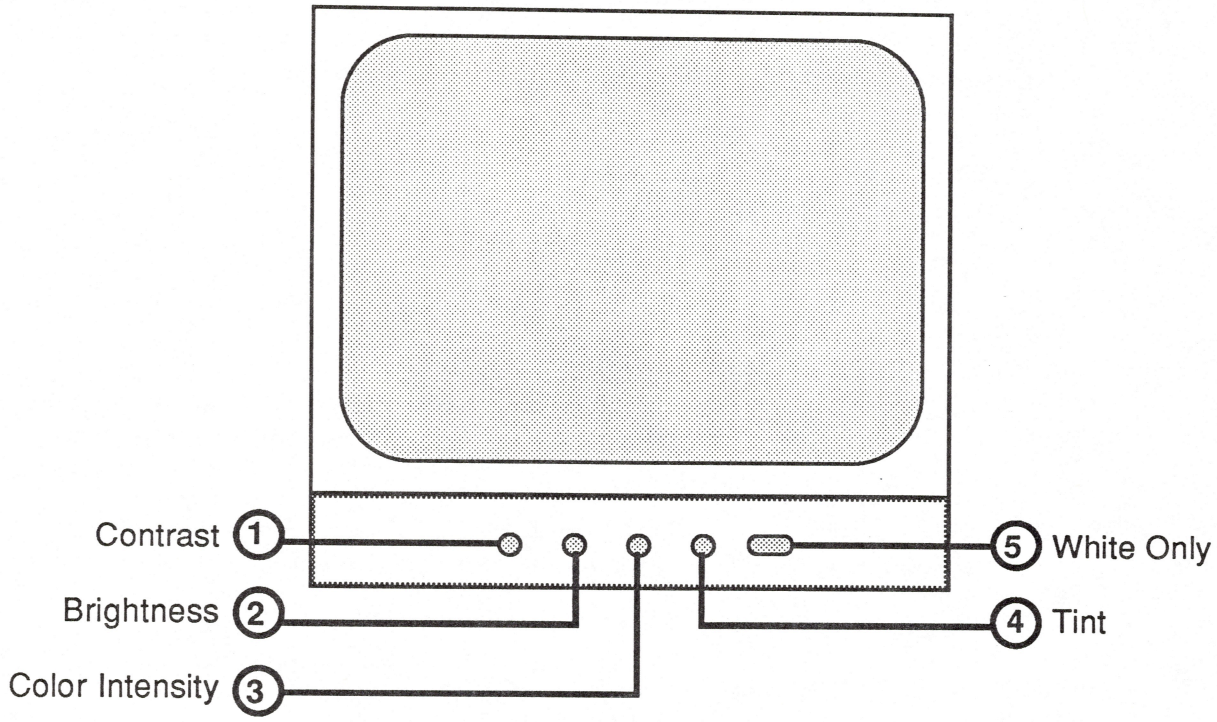
Contrast 1
Brightness 2
Color Intensity 3
5 White Only
4 Tint

FIGURE 8

22. Adjust the **COLOR INTENSITY** control (Figure 8, #3) and the **CONTRAST** control (Figure 8, #1) for optimum color viewing.

23. Adjust the **TINT** control (Figure 8, #4) until the yellow color bar is at its yellowest hue.

24. Turn off the monitor and the computer and disconnect the video cable and power cords.

25. Replace the rear cover. (See "Replacing the Rear Cover" in the Series "S" Take-Apart section.)

Color Adjustment Procedure - Series "H"

1. Turn the monitor off and disconnect the power cord.

2. Disconnect the video cable from the back of the monitor.

3. Remove the rear cover. (See "Removing the Rear Cover" in the Series "H" Take-Apart section.)

4. Set the monitor on its feet and reconnect the power cord and video cable. **(READ AND FOLLOW WARNING, p. 4.1.)**

5. Install the Apple II Peripherals Diskette in the drive and turn on the computer and the monitor.

6. Allow the monitor to warm up for at least 15 minutes.

7. Select "Monitor Tests" from the program's main menu.

8. Select "Color Bars" from the monitor menu.

9. Adjust the **CONTRAST** control (Figure 8, #1) to its full clockwise position.

10. Adjust the **BRIGHTNESS** control (Figure 8, #2) to its optimum viewing condition.

11. Press <ESCAPE> to return to the monitor menu.

12. Select "Full White Screen" from the monitor menu.

13. Adjust the **COLOR INTENSITY** control (Figure 8, #3) to its maximum counter-clockwise position.

14. Depress the **WHITE ONLY** switch on the front panel (Figure 8, #5).

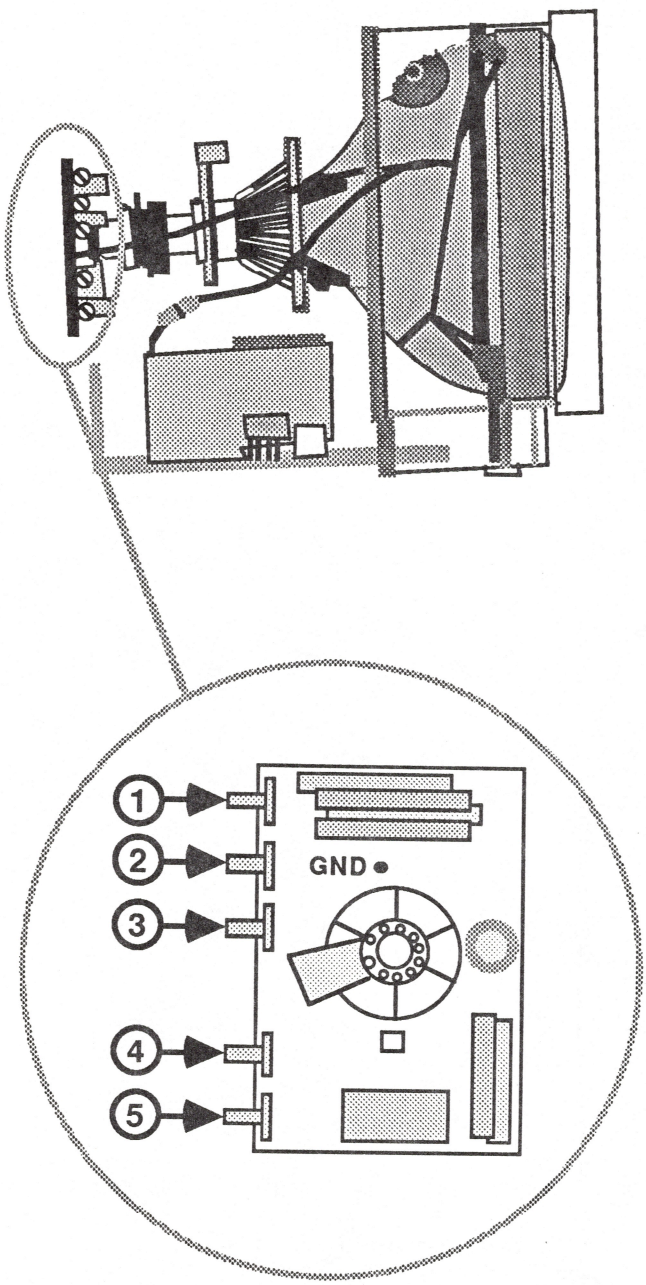

FIGURE 9

15. Locate the internal color controls on the CRT socket board (Figure 9).

    NOTE: The Series "H" monitors do NOT have a SERVICE switch.

16. **Using a plastic alignment tool or insulated screwdriver <u>AND USING EXTREME CAUTION</u>**, set the controls as follows:

    a. **B-DRIVE** (Figure 9, #1) - 1/2 clockwise position.

    b. **R-DRIVE** (Figure 9, #4) - 3/4 clockwise position.

    c. **B-BKG** (Figure 9, #2) - 1/2 clockwise position.

    d. **G-BKG** (Figure 9, #3) - 1/4 clockwise position.

    e. **R-BKG** (Figure 9, #5) - 1/2 clockwise position.

    NOTE: To set a pot at a given position, first find its mechanical center by turning clockwise as far as possible, then counter-clockwise as far as possible. Mechanical center is exactly halfway between those two extremes. The 1/4 clockwise position is halfway between the maximum counter-clockwise position and mechanical center; the 3/4 clockwise position is halfway between mechanical center and the maximum clockwise position.

17. Rotate the **B-DRIVE** control (Figure 9, #1) clockwise until the raster begins to appear bluish.

18. Rotate the **R-BKG** control (Figure 9, #5) to its 1/4 clockwise position, then rotate it clockwise until the raster just begins to show a reddish hue.

19. Alternately adjust the **B-BKG** and **G-BKG** controls (Figure 9, #2 and #3) until the raster is a grayish-white. No predominant color (red, blue, or green) should be visible. These controls should not have to be turned very far in the clockwise direction to achieve a neutral grayish-white raster.

20. Press <ESCAPE> to return to the monitor menu.

21. Select "Color Bars" from the monitor menu.

22. Return the **WHITE ONLY** switch (Figure 10, #5) to its normal position (out).

23. Adjust the front panel **COLOR INTENSITY** control (Figure 10, #3) until the raster displays the desirable amount of color.

24. Adjust the front panel **TINT** control (Figure 10, #4) so that the color block marked "Yellow" is at its yellowest hue.

25. Set the front panel **BRIGHTNESS** control (Figure 10, #2) so that the background behind the color bar pattern appears black.

26. Adjust the front panel **CONTRAST** control (Figure 10, #1) for optimum viewing comfort.

27. The color adjustment should now be within acceptable range. If not, repeat the adjustment procedure, beginning with step 9.

28. When color adjustment is correct, turn off the computer and monitor.

29. Disconnect the power cord and video cable.

30. Replace the rear cover. (See "Replacing the Rear Cover" in the "Series "H" Take-Apart section.)

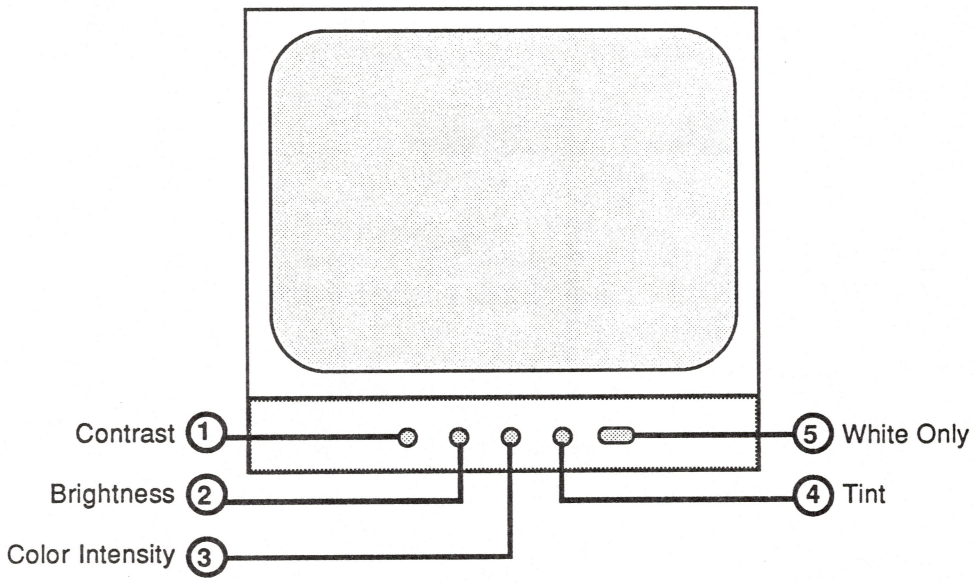

FIGURE 10

AppleColor Composite Monitor IIe/IIc and ColorMonitor IIe/IIc Technical Procedures

Section 5

Illustrated Parts List

The figures and lists below include all piece parts that can be purchased separately from Apple for the ColorMonitor IIe/IIc, along with their part numbers. These are the only parts available from Apple. Refer to your Apple Service Programs manual for prices.

Contents:

IIe Monitors:

ColorMonitor IIe, Series "S".....5.3
AppleColor Composite Monitor IIe and ColorMonitor IIe, Series "H"..... 5.5

IIc Monitors:

AppleColor Composite Monitor IIc and ColorMonitor II, Series "S"..... 5.7
ColorMonitor IIc, Series "H"..... 5.9

Packaging:

Series "H" Monitors - Packaging.....5.11

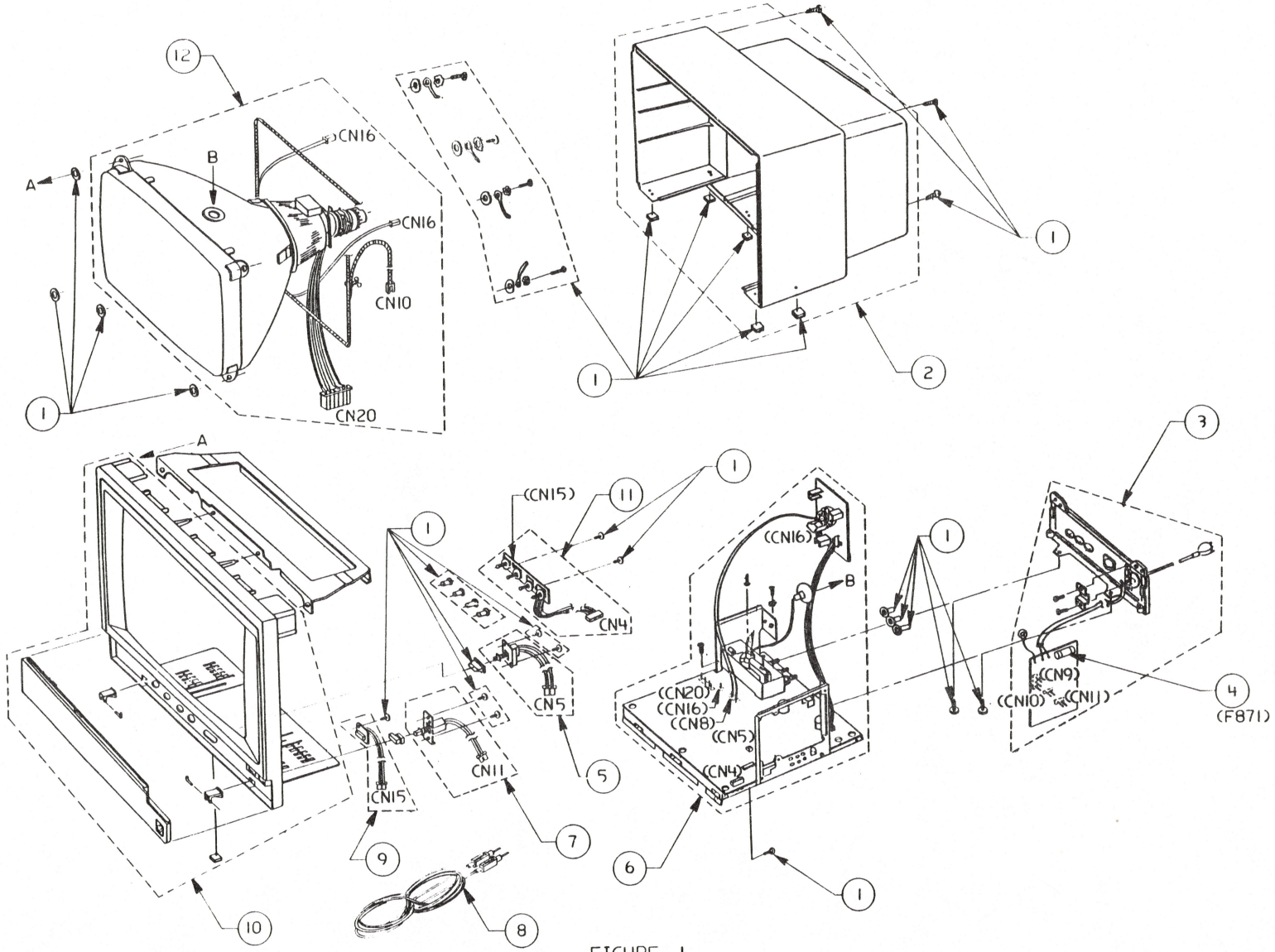
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FIGURE 1

COLORMONITOR IIe, SERIES "S" (Figure 1)

Item	Part No.	Description
1	956-0001	Screw/Knob Set, ColorMonitor-S
2	949-0019	Rear Cover, ColorMonitor IIe-S
3	970-1278	PS/Panel/AC Cord Assembly, IIe 110V-S
4	740-0102	Fuse, 3 Amp, 3AG, 250V Slow Blow
5	937-0005	Switch, White Only, ColorMonitor IIe,c-S
6	661-0308	Main Logic Board, ColorMonitor IIe and IIc-S
7	937-0006	On/Off Switch, ColorMonitor 110V-S
8	590-0539	Video Cable, Smoke
9	930-0001	LED Assembly, ColorMonitor IIe-S
10	949-0017	Bezel, ColorMonitor IIe-S
11	970-1277	Control PCB, ColorMonitor IIe,c-S
12	076-0173	CRT Assembly, ColorMonitor IIe,c-S

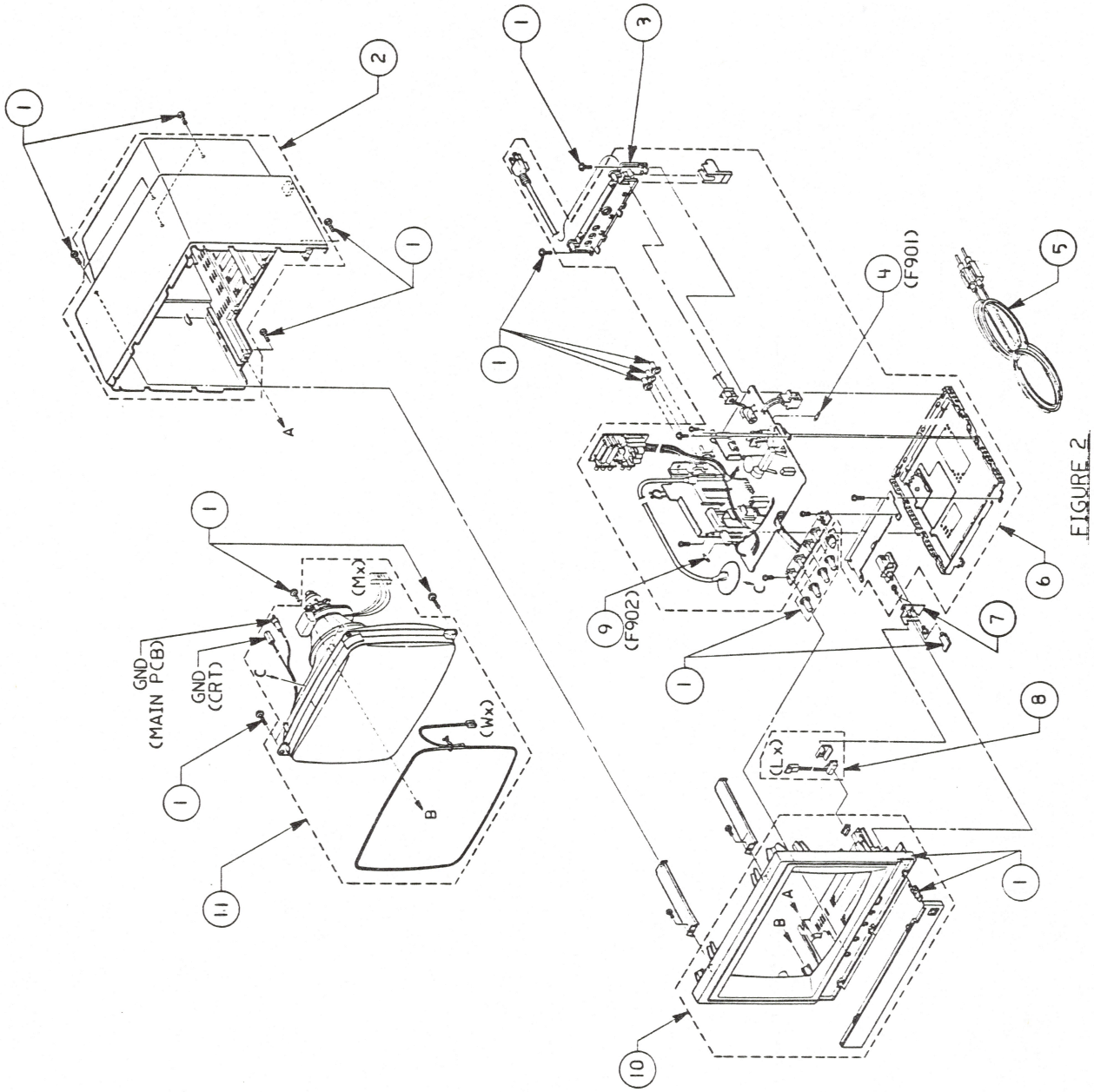
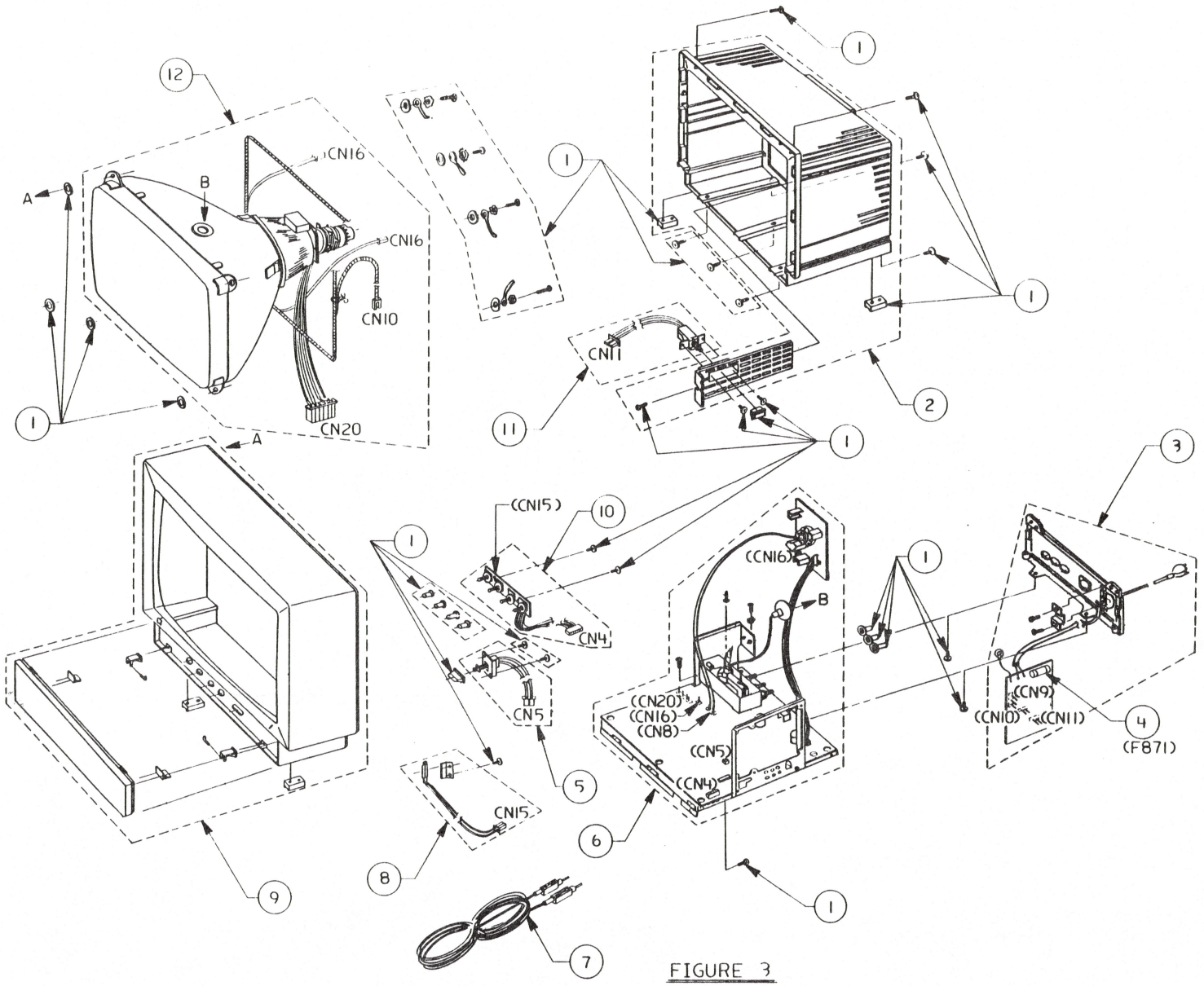


FIGURE 2

APPLECOLOR COMPOSITE MONITOR IIe/COLORMONITOR IIe, SERIES "H" (Figure 2)

Item	Part No.	Description
1	956-0002	Screw/Knob Set, ColorMonitor-H, Beige
	956-0005	Screw/Knob Set, Composite Monitor IIe-H, Platinum
2	949-0025	Rear Cover, ColorMonitor IIe-H, Beige
	949-0082	Rear Cover, Composite Monitor IIe-H, Platinum
3	949-0103	Rear Panel, Composite Monitor IIe-H, Platinum
4	740-0401	Fuse, Medium Time Lag, 4A, 125V
5	590-0539	Video Cable, Smoke
6	661-0317	Main Logic Board, ColorMonitor IIe-H and IIc-H, Composite IIe-H
7	948-0016	Switch Bracket, ColorMonitor IIe-H, Composite IIe-H
8	930-0003	LED Assembly, ColorMonitor IIe,c-H, Composite IIe-H
9	740-0304	Fuse, 1 Amp, Fast Blow
10	949-0023	Bezel, ColorMonitor IIe-H, Beige
	949-0081	Bezel, Composite IIe-H, Platinum
11	076-0194	CRT Assembly, ColorMonitor IIe,c-H, Composite IIe-H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(CN10)
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(F871)

FIGURE 3

APPLECOLOR COMPOSITE MONITOR IIc/COLORMONITOR IIc, SERIES "S" (Figure 3)

Item	Part No.	Description
1	956-0001	Screw/Knob Set, ColorMonitor-S, Beige
	956-0006	Screw/Knob Set, Composite Monitor IIc-S, Platinum
2	949-0020	Rear Cover, ColorMonitor IIc-S
3	970-1279	PS/Panel/AC Cord Assembly, ColorMonitor IIc, 110V
	970-1305	PS/Panel/AC Cord Assembly, Composite IIc, 110V
4	740-0102	Fuse, 3 Amp, 3AG, 250V Slow Blow
5	937-0005	Switch, White Only, ColorMonitor IIe,c-S
6	661-0308	Main Logic Board, ColorMonitor IIe and IIc-S, Composite IIc-S
7	590-0539	Video Cable, Smoke
8	930-0002	LED Assembly, ColorMonitor IIc-S, Composite IIc-S
9	949-0018	Bezel, ColorMonitor IIc-S, Beige
	949-0077	Bezel, Composite Monitor IIc-S, Platinum
10	970-1277	Control PCB, ColorMonitor IIe,c-S, Composite IIc-S
11	937-0006	On/Off Switch, ColorMonitor 110V-IIe/IIc-S, Composite IIc-S
12	076-0173	CRT Assembly, ColorMonitor IIe,c-S, Composite IIc-S

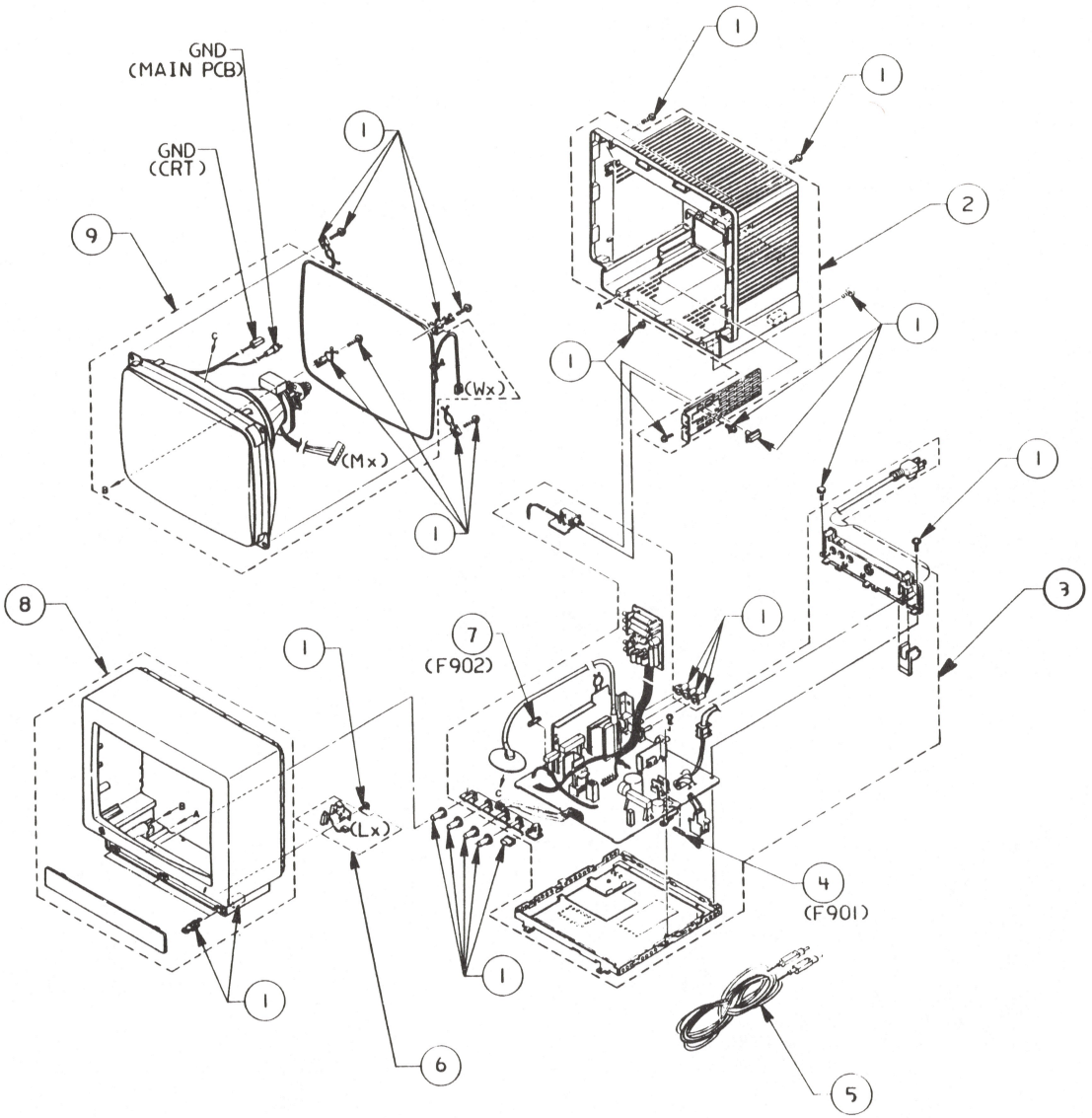

FIGURE 4

COLORMONITOR IIc, SERIES "H" (Figure 4)

Item	Part No.	Description
1	956-0002	Screw/Knob Set, ColorMonitor-H
2	949-0026	Rear Cover, ColorMonitor IIc-H
3	661-0317	Main Logic PCB, IIe and IIc-H
4	740-0401	Fuse, Medium Time Lag, 4A, 125V
5	590-0539	Video Cable, Smoke
6	930-0003	LED Assembly, ColorMonitor IIe,c-H
7	740-0304	Fuse, 1 Amp, Fast Blow
8	949-0024	Bezel, ColorMonitor IIc-H
9	076-0194	CRT Assembly, ColorMonitor IIe,c-H

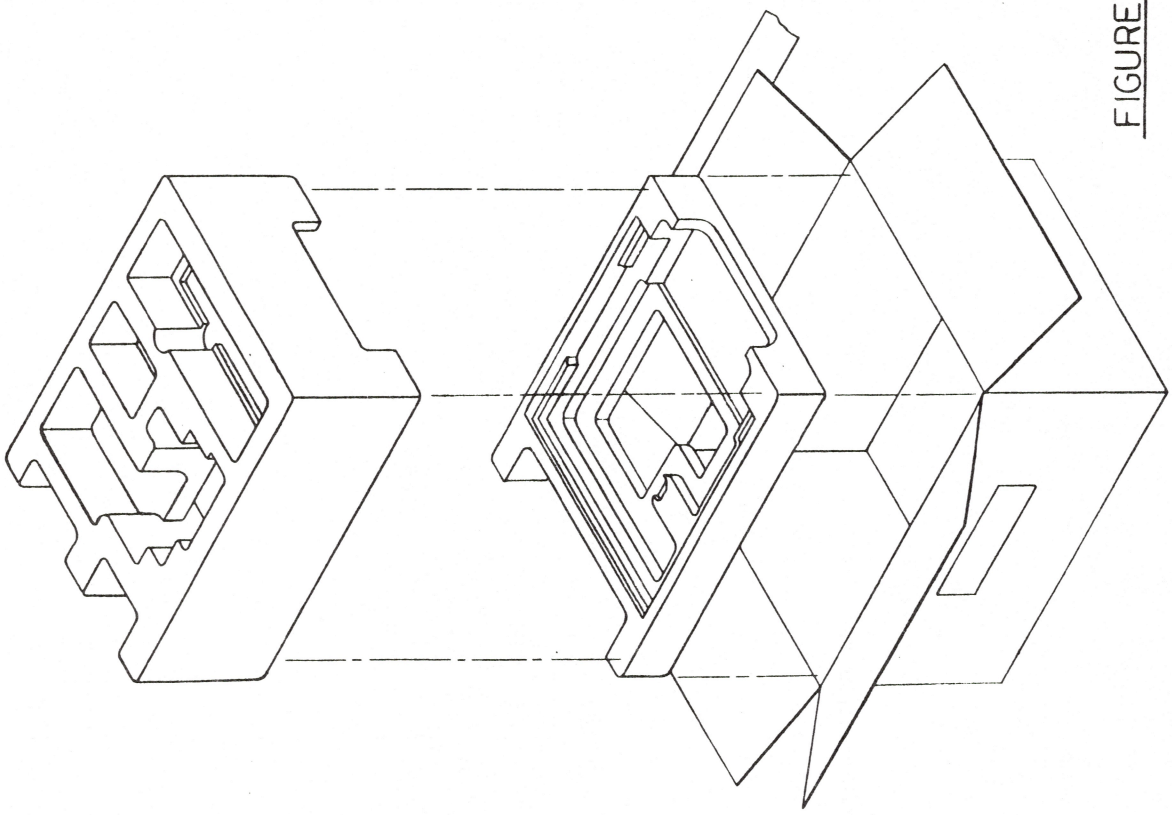

FIGURE 5

SERIES "H" MONITORS - PACKAGING (Figure 5)

Part No.	Description
602-0154	Packaging, ColorMonitor IIe/IIc-H, Composite IIe-H

AppleColor RGB Monitor

Apple Technical Procedures

AppleColor RGB Monitor

Technical Procedures

❑ TABLE OF CONTENTS

Section 1 – Basics	1.21	Product Description
	1.2	RGB Color Signal
	1.2	Location of Controls
	1.4	Safety Precautions
	1.4	Safe Electrical Setup
	1.5	CRT Safety Rules
	1.7	Live Adjustment Rules
	1.8	Disposing of the Cathode-Ray Tube (CRT)
Section 2 – Take-Apart	2.2	Discharging the Cathode-Ray Tube (CRT)
	2.4	Rear Cover
	2.7	Switch Panel Controls
	2.10	CRT Video Board
	2.14	Main Logic Board
	2.19	AC Cord Assembly
	2.20	Cathode-Ray Tube (CRT)
	2.24	LED Assembly
	2.26	Main Logic Board Fuse
Section 3 – Adjustments	3.3	Introduction
	3.3	Important Safety Tips
	3.4	Pre-Adjustment Set-Up Procedure
	3.7	Vertical Adjustments
	3.7	Horizontal Adjustments
	3.9	Linearity Adjustments
	3.9	Focus Adjustments
	3.11	Color Adjustments
Section 4 – Troubleshooting	4.2	Introduction
	4.2	Important Terms
	4.2	Directions

...Continued on next page

Section 4 – Troubleshooting (Continued)

4.3 Adjustments Check Procedure
4.3 Set-Up
4.4 To Select a Test
4.4 To Deselect a Test
4.4 Perform Adjustment Checks
4.5 Geometric Display Checks
4.6 Focus Check
4.6 Color Check
4.7 Troubleshooting Table

Section 5 – Illustrated Parts List

5.3 Bezel Assembly
5.5 CRT
5.7 Power Supply, Video Board
5.9 Rear Cover and Controls
5.11 Cables and AC Cord

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Apple Technical Procedures

AppleColor RGB Monitor

Section 1 – Basics

❑ CONTENTS

1.2 Product Description
1.2 RGB Color Signal
1.2 Location of Controls
1.4 Safety Precautions
1.4 Safe Electrical Setup
1.5 CRT Safety Rules
1.7 Live Adjustment Rules
1.8 Disposing of the Cathode-Ray Tube (CRT)

❑ PRODUCT DESCRIPTION

RGB Color Signal

The AppleColor™ RGB Monitor is a 12-inch display monitor operated with individual red, green, and blue video input signals. It uses a DB-15 connector and cable to carry these and synchronization signals from the computer's video output jack.

Location of Controls

The power switch and the brightness and contrast controls for the AppleColor RGB are on the right side of the case near the top (Figure 1).

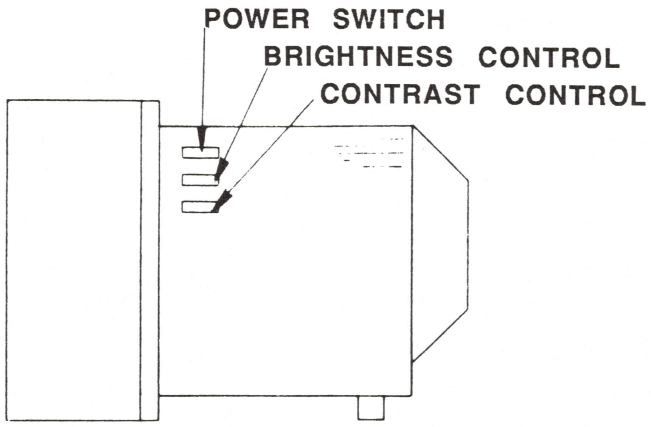


FIGURE 1

Less frequently used controls are at the back of the monitor (Figure 2).

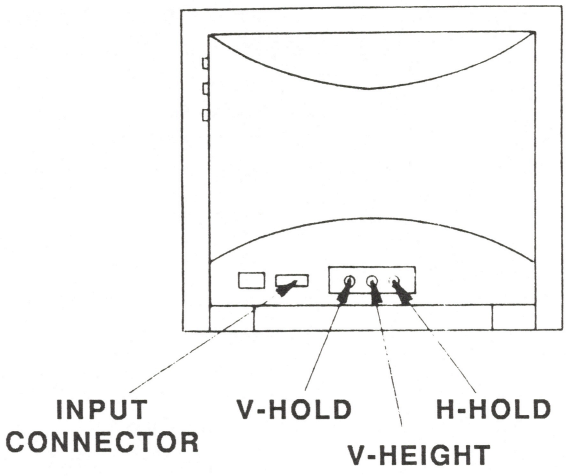


FIGURE 2

Internationally recognized symbols, shown in Figure 3, are used to identify the various controls.

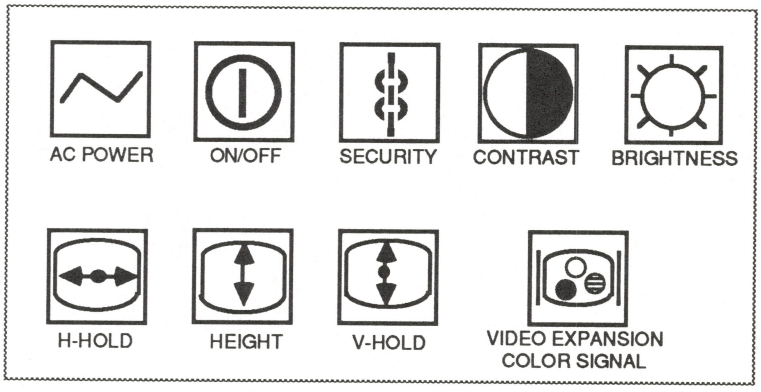


FIGURE 3

❑ SAFETY PRECAUTIONS

The AppleColor RGB Monitor is harmless as long as you're just watching the display. Once you remove the cover, however, you are exposed to the high-voltage Cathode-Ray Tube (CRT)—the picture tube. The following precautions must be taken to ensure your safety, especially when you are making adjustments on a live monitor.

Safe Electrical Setup

- **Be sure your outlet is correctly wired and properly grounded.**

  Polarity and ground testers are available from most electronics stores. Test all outlets in your service shop before working on **any** electrical equipment. If you have any doubts about your building's wiring, consult a qualified electrician.

- **Never use an adaptor plug to connect a monitor's three-prong power plug to a two-prong wall outlet.**

  Adaptors defeat the ground pin, which is a safety feature.

- **When performing live adjustments, use an isolation transformer between the monitor and the outlet.**

  Order an isolation transformer from your electronics distributor, and make it a practice to use it whenever you are working with **any** charged monitor or other powered system under test. An isolation transformer isolates the circuitry of the system under test from the power company's circuitry, thus reducing the likelihood of a fatal shock should you simultaneously contact high voltage and anything else that is earth-grounded.

  Do not connect more equipment to the transformer than the wattage capacity of the transformer will bear. (It is usually best to connect only one piece of equipment at a time.) We recommend an isolation transformer with a minimum wattage capacity of 500 VA, with grounded three-prong cord and receptacle. Two such transformers, available from many electronics stores and distributors, are listed below:

  Triad N-57M Stancor GIS 500

CRT Safety Rules

- **Do not work on a monitor alone.**

  If there is an accident, it could save your life to have someone else nearby. Apple recommends that your staff be trained in cardio-pulmonary resuscitation (CPR).

- **Remove rings, wristwatches, bracelets, hanging necklaces, and other jewelry before performing repairs on a monitor.**

  Metal jewelry is an excellent conductor of electricity. Removing jewelry will reduce the possibility of electric shock.

- **Never use a grounding wriststrap or heelstrap or work on a grounded workbench mat when discharging a monitor or when performing live adjustments.**

  Grounding wriststraps, heelstraps, and mats are used to protect sensitive components from the damaging effects of electrostatic discharge from your own body or clothing. Even though they contain a one-megohm resistor and are designed to conduct only small electrical charges, we recommend that they be used **only** when working on "dead" (uncharged) equipment.

- **Wear safety goggles when working with a CRT.**

  The CRT contains a high vacuum. If cracked or broken, it can implode (collapse into itself), then explode. To protect your eyes from serious injury, always wear safey goggles when working on or near a CRT, and be careful of other people in the area.

- **Before working inside a monitor, turn off the power and disconnect the AC power cord.**

  Certain parts of a monitor chassis are **hot** (electrified) when the monitor is under power. Except when you **must** have the power on (for example, when making live adjustments), never work on a plugged-in monitor—even if you have the power turned off.

- **Keep one hand in your pocket or behind your back when working on a live monitor.**

  This practice reduces the risk of current passing through your heart, should you accidentally contact high voltage.

- **Always discharge the anode before touching anything inside the monitor.**

  High voltage (approx. 24,000 volts DC) can be present on the anode (Figure 4, #1) and other components—even when power is off. Discharging the anode reduces the risk of injury. (See "Discharging the Cathode-Ray Tube (CRT)" in Section 2, Take-Apart.)

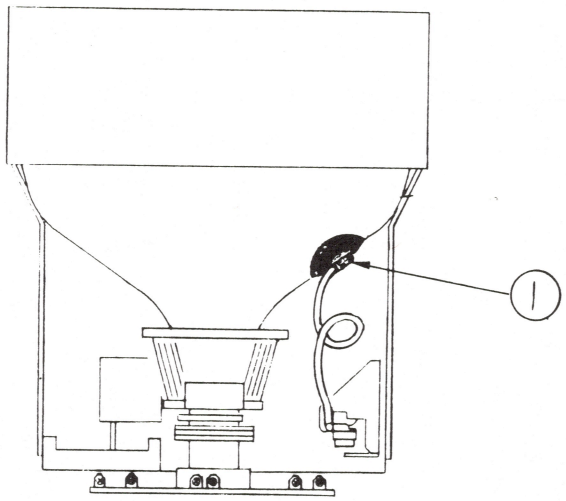


FIGURE 4

- **Never touch the anode connector or the anode aperture.**

  Normally the anode aperture has a connector plugged into it (Figure 4, #1). When a CRT is replaced, the anode connector is removed, exposing the anode. The anode can retain a charge of several thousand volts (even when power is off) and can regain some charge even after it has been discharged.

- **Do not pick up or handle a CRT by its neck.**

  To prevent an implosion, you should take every precaution against breaking the tube. Be especially careful with the neck, the area where the tube is the thinnest.

Live Adjustment Rules

In addition to the precautions listed on the previous pages, never touch the following components when adjusting a live monitor:

- The yoke wires (Figure 5, #1)
- The anode connector (Figure 5, #2)
- The anode wire (Figure 5, #3)
- The flyback transformer (Figure 5, #4)

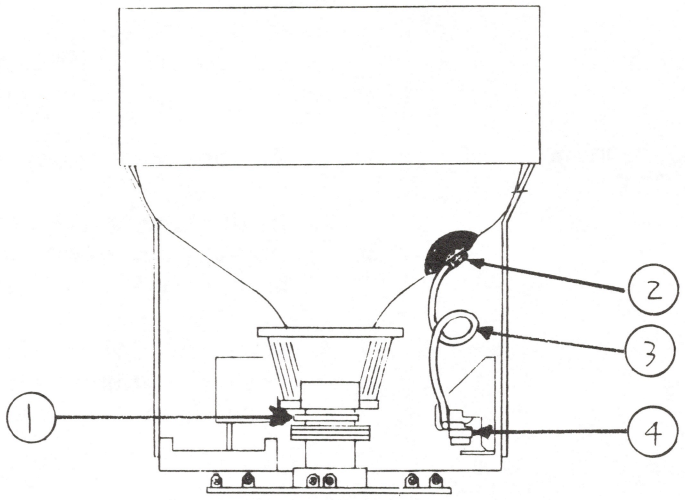


FIGURE 5

WARNING: *Serious injury could result if you touch any of these components with the power on.*

❑ DISPOSING OF THE CATHODE-RAY TUBE (CRT)

Remember that a CRT can implode unless devacuumed. Putting a defunct CRT into a trash receptacle without devacuuming it can endanger other people.

Materials Required

Thick cardboard box, large enough to conceal the CRT
Large, sharp, diagonal cutters
Large pliers
Duct tape
Safety goggles
Gardening gloves
12-inch square of cloth or heavy paper

Devacuuming the CRT

1. Put on safety goggles.
2. In the side of the box about six inches from the bottom, cut or drill a hole just large enough to accommodate the very tip of the CRT neck.
3. Place the CRT inside the box with the tip of the neck protruding through the hole, and tape the box flaps down with the duct tape (Figure 6).

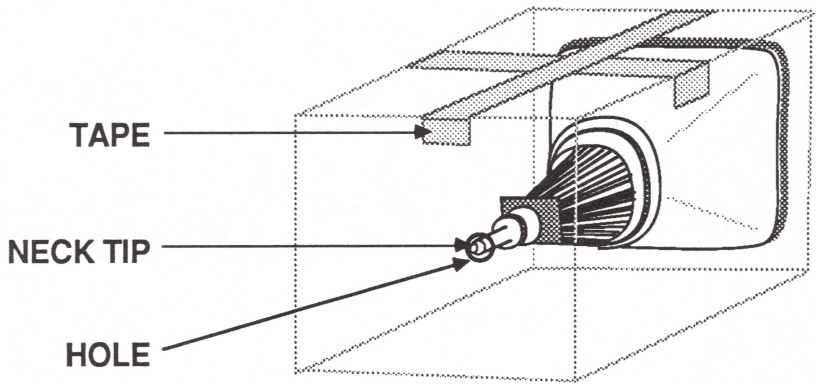


FIGURE 6

WARNING: *Only the very tip of the CRT neck should be protruding through the hole in the box. The box must not have any other openings.*

4. Put on the gloves.

5. Using the diagonal cutters, carefully clip off the connector pins around the black plastic guide on the end of the CRT neck.

6. Tape the piece of cloth or paper onto the box (Figure 7, #1) so that it forms a veil over the opening (Figure 7, #2) but allows your hand access to the tip of the CRT. The veil's purpose is to catch bits of glass that may fly during the following step.

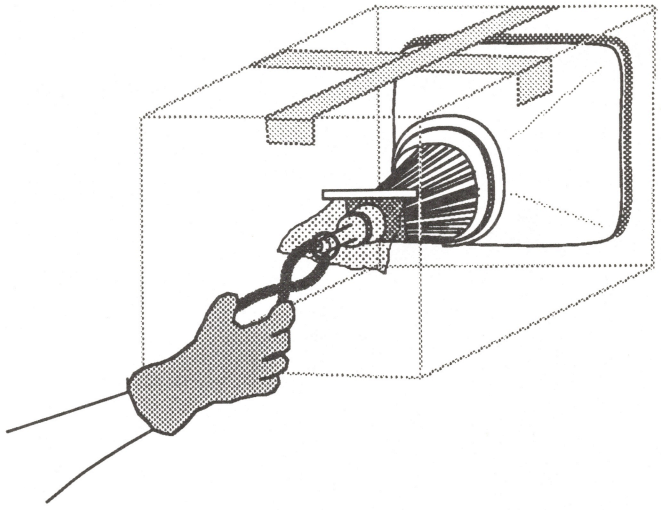


FIGURE 7

7. Make sure no one is standing nearby. Place the pliers under the veil, stand to one side, and look away while you use the pliers to twist the black plastic guide off of the CRT neck with the pliers. Then snip off the exposed tip of the CRT.

WARNING: *Do not look directly at the box when cutting off the tip of the CRT!*

Note: You will probably hear a rush of air entering the CRT when the CRT vacuum breaks—but even if you don't, the procedure is complete if the interior of the CRT is clearly visible through the opening created by the removed tip.

Apple Technical Procedures

AppleColor RGB Monitor

Section 2 – Take-Apart

❑ CONTENTS

2.2 Discharging the Cathode-Ray Tube (CRT)
2.4 Rear Cover
2.7 Switch Panel Controls
2.10 CRT Video Board
2.14 Main Logic Board
2.19 AC Cord Assembly
2.20 Cathode-Ray Tube
2.24 LED Assembly
2.26 Main Logic Board Fuse

Note: If a step is underlined, detailed instructions for that step can be found elsewhere in this section.

❑ DISCHARGING THE CATHODE RAY TUBE (CRT)

Materials Required

Medium flathead screwdriver (shaft at least 6 inches)
12-inch (or longer) cable with small alligator clips at either end
Safety goggles
Small needlenose pliers

Discharging the CRT

1. Turn off the monitor and disconnect the AC power cord.
2. Remove the rear cover. (See "Rear Cover.")
3. Set the monitor upright, with the back facing you.
4. Remove any metal jewelry (rings, watches, bracelets, etc.) and grounding wriststraps.
5. Put on safety goggles.

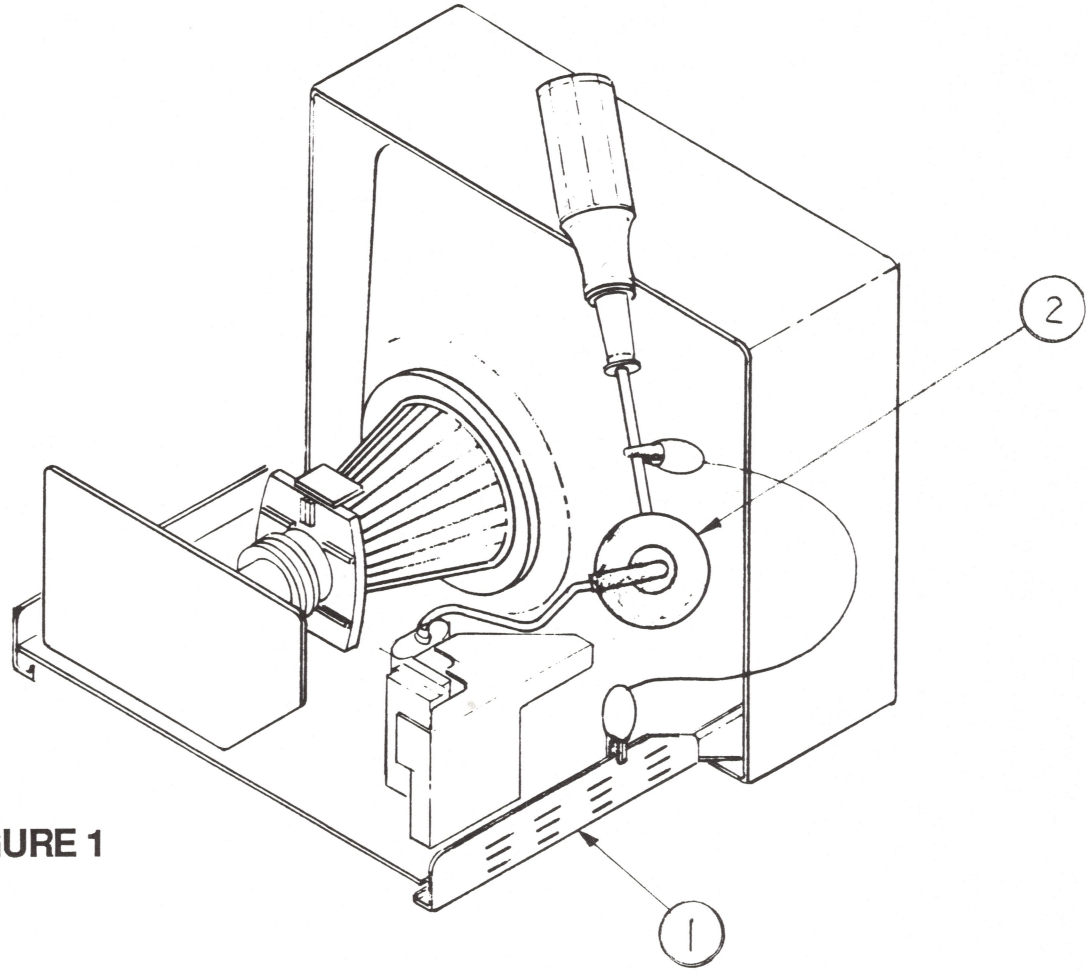


FIGURE 1

6. Attach one end of an alligator lead to a long flatblade screwdriver, two inches from the insulated handle. Attach the other end to any part of the metal bracket that mounts the main logic board. (Figure 1, #1.)

WARNING: *USE ONLY ONE HAND WHILE DISCHARGING THE CRT. This is to prevent your becoming a path for current should your hand slip and touch the metal part of the screwdriver. While discharging the CRT, grasp only the insulated handle of the screwdriver.*

---

7. Slide the screwdriver under the CRT anode cap (Figure 1, #2), and push it toward the center of the cap until the blade contacts the metal anode ring.

CAUTION: *DO NOT USE FORCE. If it is difficult to get the screwdriver under the anode cap, use a smaller screwdriver to loosen the suction of the anode cap on the tube. Discharge the anode by touching the anode ring with the large screwdriver; then withdraw the screwdriver slightly and touch the anode ring again.*

---

8. Remove the screwdriver and disconnect the alligator clips from the monitor.

9. Peel back the anode cap until you can see the anode ring at the center. Look at the metal connector in the center of the cap and notice how it is clipped into the CRT. Use the needlenose pliers to compress the two prongs on the clip to free it from the CRT, and lift it off the tube.

   Note: A secondary charge can build up even after you have discharged the CRT. To ensure that any residual charge is dissipated during the service procedure, establish a path for anode current to ground by leaving one alligator clip fastened to the metal chassis and the other clip fastened to the edge of the anode aperture.

❑ REAR COVER

Materials Required

Medium Phillips screwdriver

Remove

1. Turn the monitor off and disconnect the power cord.
2. Disconnect the video cable from the back of the monitor.
3. Carefully set the monitor on its face (screen side) so that the back is facing up.

Note: The AppleColor RGB Monitor contains sensitive components that can be damaged by rough treatment. Whenever it is necessary to turn the monitor over, be sure to rest it on a protective pad.

4. Remove the four screws (Figure 2, #1) from the rear of the monitor.

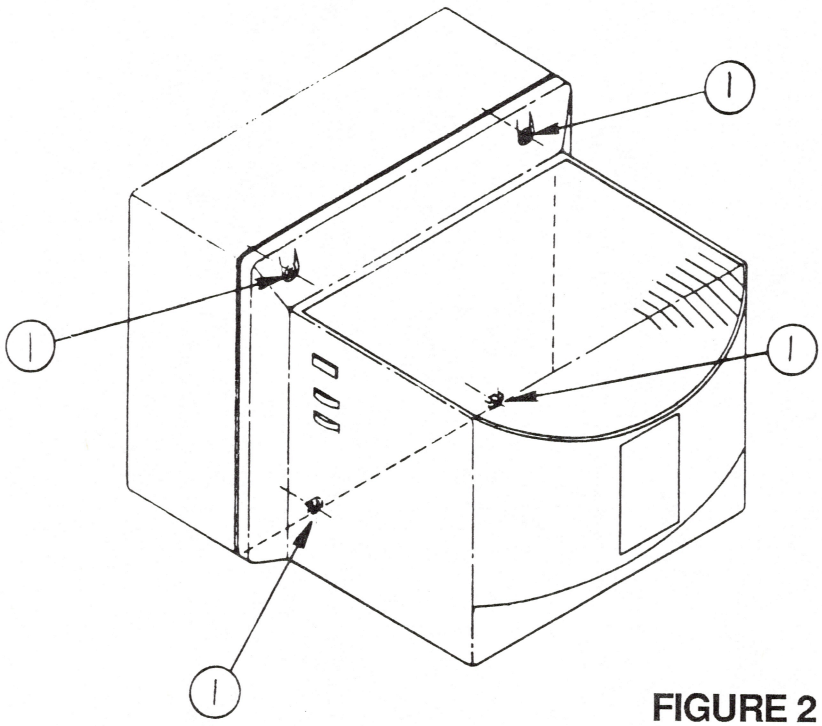


FIGURE 2

5. Carefully set the monitor upright. The switch panel on the right front side of the rear cover is plugged into the main logic board and the CRT video board, so the rear cover cannot be totally removed until these cables are unplugged.

6. Gently pull the rear cover out about eight inches until connector S3 on the main logic board is easily accessible (Figure 3, #1). Unplug connector S3 at the main logic board.

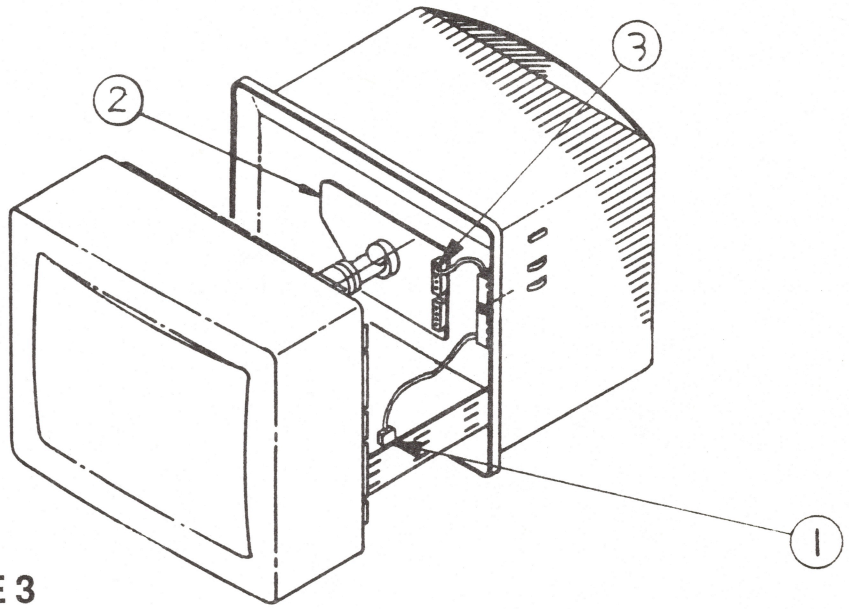


FIGURE 3

7. Carefully pull the rear cover out another six inches until the CRT video board is easily accessible (Figure 3, #2). Unplug connector VC (Figure 3, #3) at the CRT video board.

8. Pull the AC power cord through the opening in the rear cover, and set the rear cover aside.

9. **DISCHARGE THE CRT.** (See "Discharging the Cathode Ray Tube.")

Replace

1. Guide the AC power cord through the opening in the rear cover. Slide the cover onto the monitor, leaving the CRT video board (Figure 3, #2) accessible, as shown in Figure 3.

2. Install the brightness and contrast controls cable into connector VC on the CRT video board (Figure 3, #3).

3. Slide the rear cover on the monitor another six inches and install the ON/OFF switch cable into connector S3 (Figure 3, #1); then slide the cover on the rest of the way.

4. Carefully position the monitor face down, and install the four screws (Figure 2, #1) at the back of the monitor.

5. Perform the Adjustments Check procedure in the Troubleshooting section to verify that the monitor is functioning properly.

❑ SWITCH PANEL CONTROLS

Materials Required

Medium Phillips screwdriver
Small flathead screwdriver
Small diagonal cutters
Small crescent wrench (thin-jawed pliers will do)
Small cable ties

Remove

1. Turn off the monitor and disconnect the AC cord.

2. Remove the rear cover. (See "Removing the Rear Cover.)

3. **DISCHARGE THE CRT** if it hasn't already been discharged. (See "Discharging the Cathode Ray Tube [CRT].")

Switch Panel

4. Remove the screw (Figure 4, #1) that secures the switch panel to the rear cover, and then remove the switch panel.

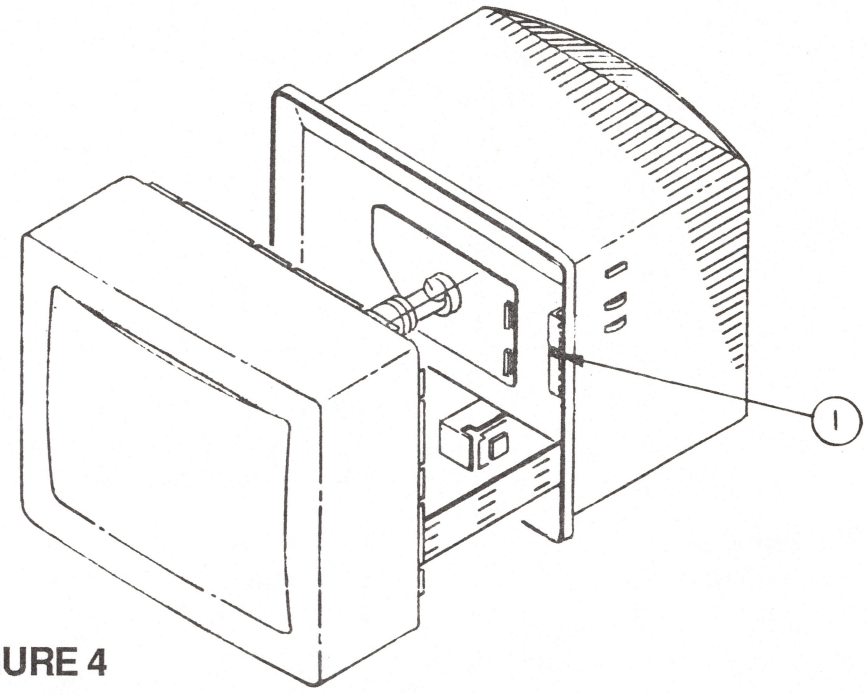


FIGURE 4

On/Off Switch

5. Locate the plastic ON/OFF switch button on the switch panel (Figure 5, #1) and pull it off the ON/OFF switch shaft. If necessary, use the small flathead screwdriver to pry off the switch.

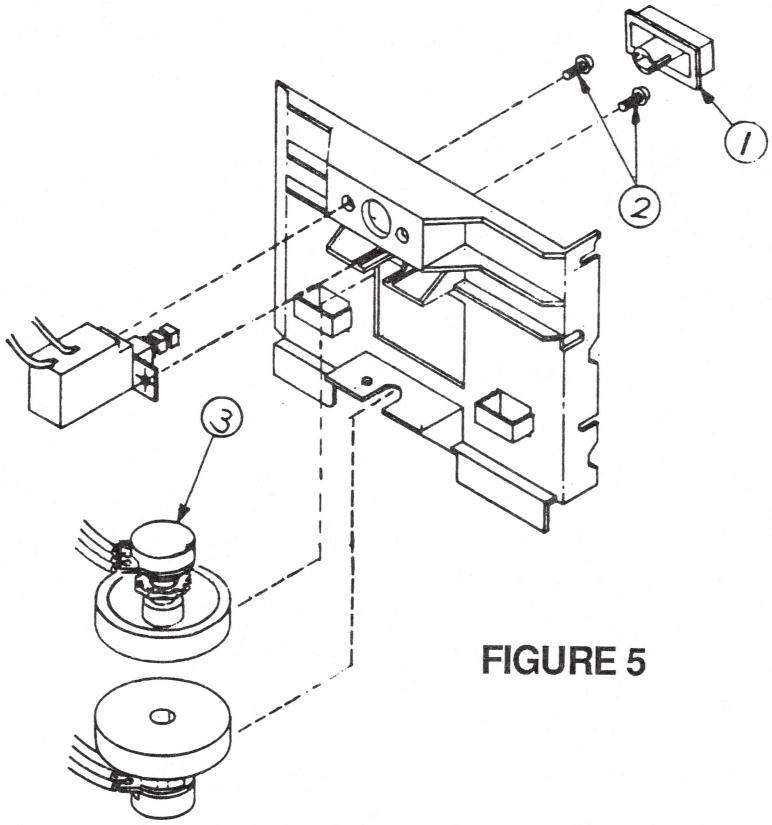


FIGURE 5

6. Remove the two screws (Figure 5, #2) that secure the ON/OFF switch to the switch panel, and remove the ON/OFF switch.

Brightness and Contrast Controls

7. Loosen the locking nuts (Figure 5, #3), that secure the brightness and contrast controls to the switch panel, until the controls can be removed.

8. Cut the cable ties with the diagonal cutters, and remove the brightness and contrast controls from the switch panel.

Replace

Brightness and Contrast Controls

1. Replace the brightness and contrast control potentiometers so that their metal tabs are inserted into their cutouts on the switch panel, and tighten the locking nuts (Figure 5, #3) that secure them to the switch panel.

2. Push the plastic brightness and contrast control thumbwheels onto their shafts as far as possible toward their respective potentiometers.

On/Off Switch

3. Replace the two screws (Figure 5, #2) that secure the ON/OFF switch to the switch panel.

4. Replace the switch button (Figure 5, #1).

Switch Panel

5. Install the screw (Figure 4, #1) that secures the switch panel to the rear cover.

6. Install the notches at the rear of the switch panel into the plastic retaining slots on the rear cover.

7. Install cable ties to secure the ON/OFF switch and brightness and contrast control cables to the switch panel.

8. Replace the rear cover. (See "Rear Cover.")

❑ CRT VIDEO BOARD

Materials Required

40-watt soldering iron, solder, and solder sucker
Medium Phillips screwdriver
Sharp diagonal cutters or X-acto knife
RTV or silicon glue
Small cable ties

Remove

1. Remove the rear cover.

2. Discharge the CRT if you haven't already done so.

3. Use an X-acto knife or a pair of sharp diagonal cutters to carefully cut off the silicon glue that holds the CRT video board to the CRT neck (see Figure 6).

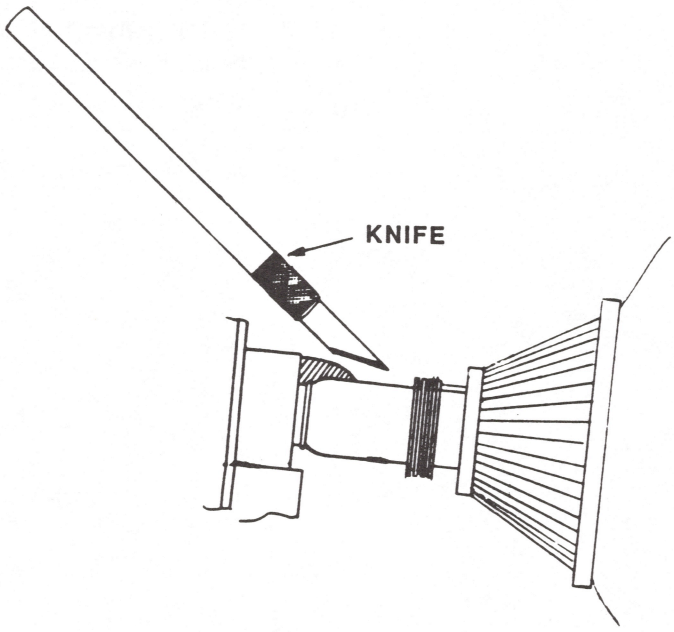


FIGURE 6

4. Cut any cable ties that prevent the CRT video board from being removed.

5. Slip the CRT video board off the CRT (see Figure 7).

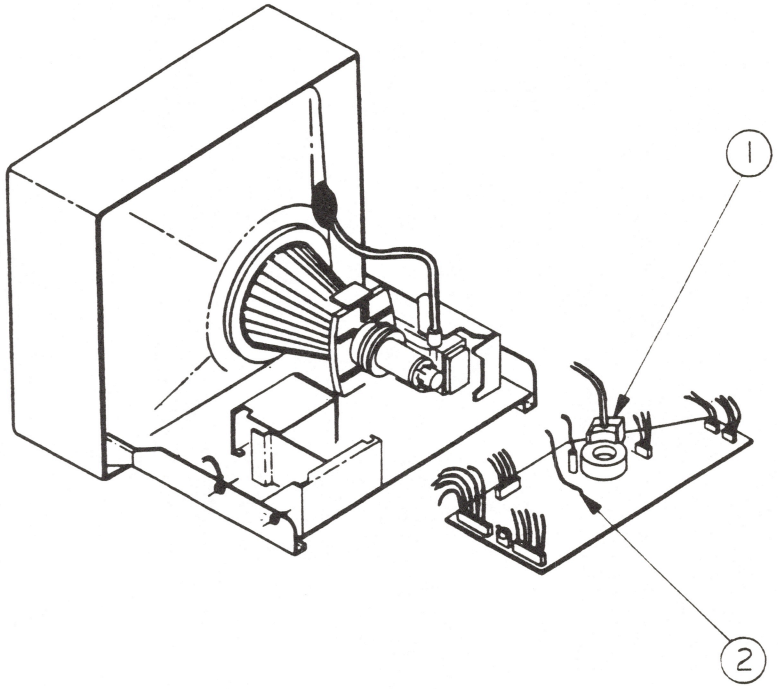


FIGURE 7

6. Remove the plastic shield (Figure 7, #1) covering the focus wire (black) terminal. Desolder the focus wire from the terminal.

7. Desolder the screen wire (gray) from the SC terminal on the CRT video board (Figure 7, #2).

   Note: Gently pull on the wire from the component side of the board while you hold the soldering iron tip against the wire's terminal on the noncomponent side of the board. When the solder liquifies, the wire should come through.

WARNING: *Do not leave the soldering iron tip on the wire's terminal too long, or the board may be damaged.*

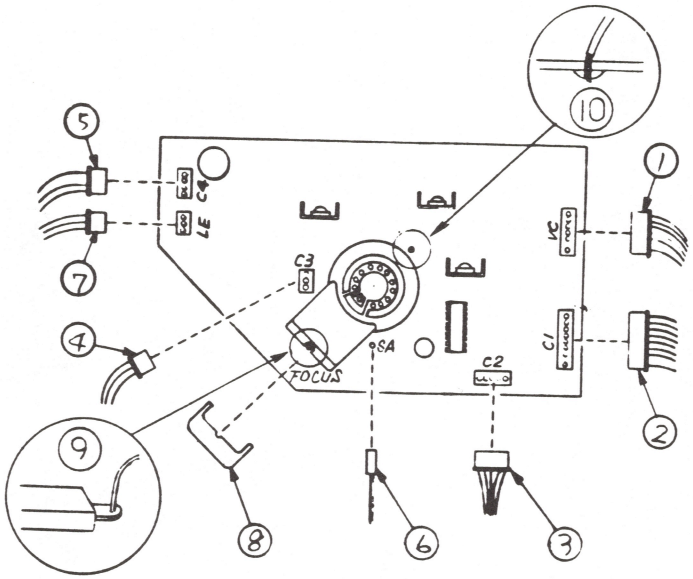


FIGURE 8

8. Unplug these connectors from the CRT video board:

- VC Figure 8, #2 (to the main logic board)
- C2 Figure 8, #3 (to the main logic board)
- C3 Figure 8, #4 (to the main logic board)
- C4 Figure 8, #5 (to the main logic board)
- SA Figure 8, #6 (ground wire around the CRT)
- LE Figure 8, #7 (to the LED assembly)

Replace

1. Solder the focus wire (black) to the terminal on the CRT video board (Figure 8, #9). Replace the plastic shield (Figure 8, #8).

2. Solder the screen wire (gray) to the SC terminal on the CRT video board (Figure 8, #10).

3. Connect the following CRT video board connectors:

   - VC Figure 8, #2 (to the main logic board)
   - C2 Figure 8, #3 (to the main logic board)
   - C3 Figure 8, #4 (to the main logic board)
   - C4 Figure 8, #5 (to the main logic board)
   - SA Figure 8, #6 (ground wire around the CRT)
   - LE Figure 8, #7 (to the LED assembly at the front of the monitor)

4. Install the CRT video board on the CRT neck.

5. Where appropriate, route cables through the plastic cable standoffs, and secure them to the CRT video board with cable ties.

6. Apply the silicon glue to secure the CRT video board to the end of the CRT neck (Figure 6).

7. Replace the rear cover.

❑ MAIN LOGIC BOARD

Materials Required

40-watt soldering iron, solder, and solder sucker
Medium Phillips screwdriver
Sharp diagonal cutters
RTV or silicon glue
Small cable ties
Small pliers with thin jaws

Remove

1. Remove the rear cover.

2. Discharge the CRT if it hasn't been discharged already.

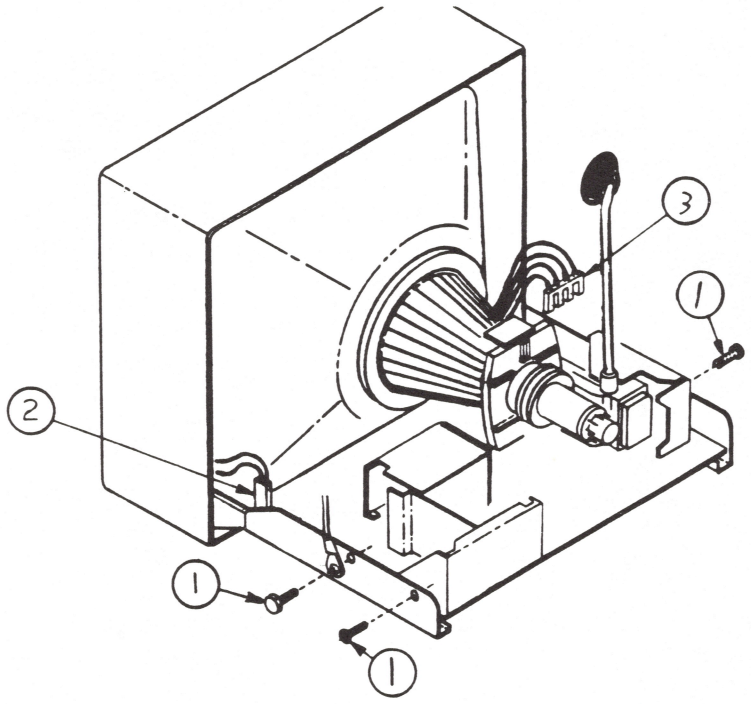


FIGURE 9

3. If the main logic board is the module being replaced, remove the CRT video board. If the main logic board is being removed to get at something else, leave the CRT video board installed, but unplug connectors SA and LE on the CRT video board, and cut any cable ties that restrict their removal.

4. Carefully unplug connector PC (Figure 9, #2).

5. If the main logic board is the module that is being replaced, remove the AC power cord receptacle. If the main logic board is just being removed to get at something else, leave the AC power cord receptacle installed.

6. Remove the three screws (Figure 9, #1) that secure the main logic board to the metal chassis. Note which screw holds the ground wire.

7. Fold back the rubber boot enclosing the anode cap until the metal anode clip is exposed; then use the pliers to squeeze the prongs on the anode clip together while you remove the clip from the CRT.

8. Slide the main logic board out of the metal chassis about four inches.

9. Carefully unplug connector DY (Figure 9, #3).

10. Remove the main logic board from its metal tray.

11. Remove the three adjustment knobs on the back of the logic board that match the monitor case. Save the knobs to use on the replacement board.

Replace

1. Set the monitor upright on its feet.

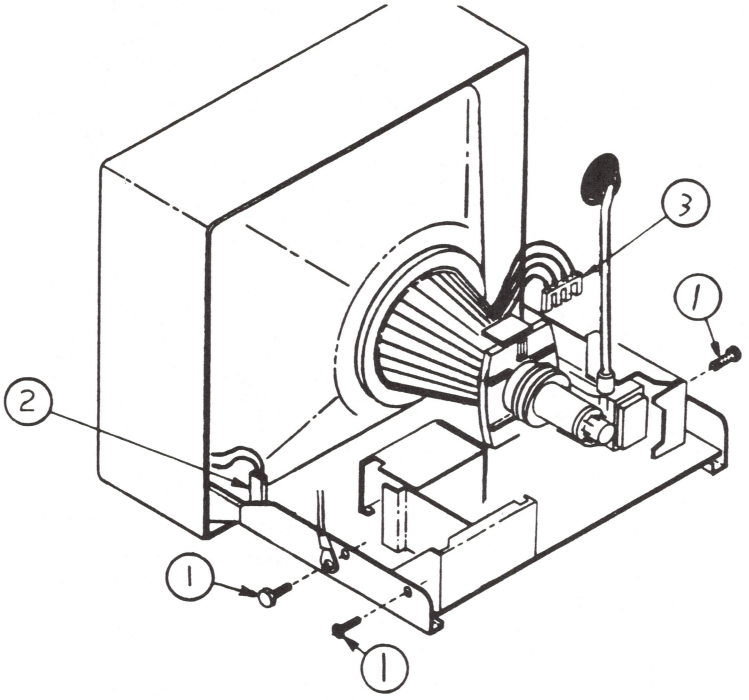


FIGURE 10

2. Slide the main logic board about an inch into its metal tray, and install connector DY (Figure 10, #3).

   Note: The logic board must slide between the notches in the sides of the metal tray. If the board is not installed between these notches, it can short out to the metal tray.

3. Slide the main logic board the rest of the way into its metal tray. Replace the three screws (Figure 10, #1) and the ground wire.

4. Replace the AC cord assembly if it was removed.

5. Use the pliers to squeeze the prongs on the anode clip together while you install it into the anode on the CRT.

6. Install the PC connector (from the degaussing coil surrounding the CRT—Figure 10, #2) on the main logic board.

7. Plug connectors SA and LE into the CRT Video board, and replace the CRT video board if it was removed.

8. Replace the three plastic knobs that match the case.

9. Replace the rear cover.

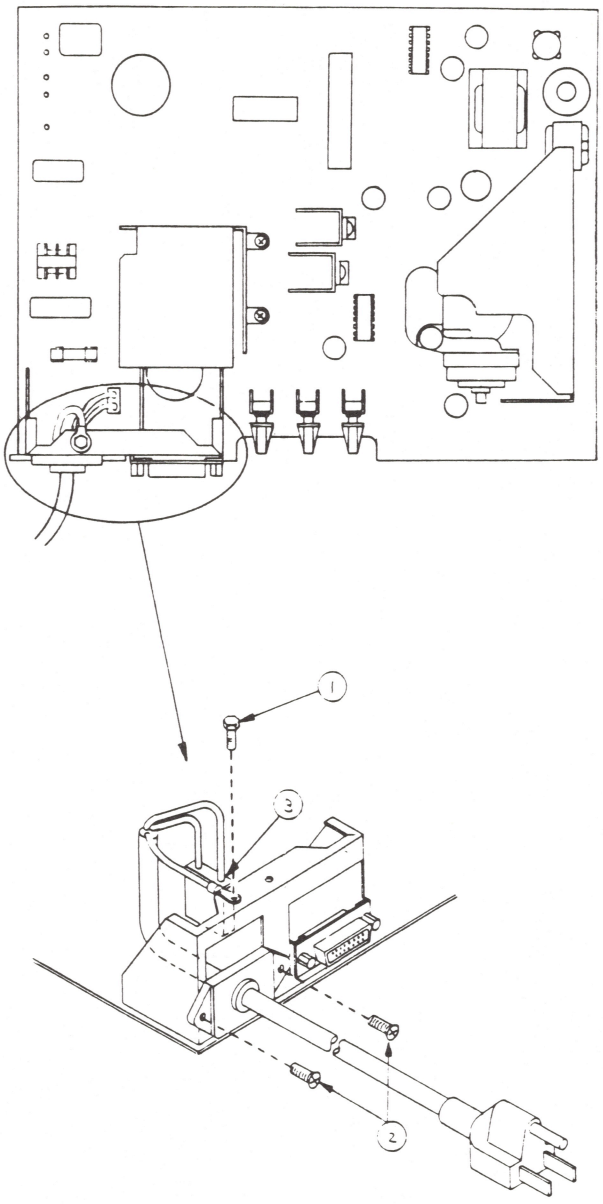


FIGURE 11

❑ AC CORD ASSEMBLY

Materials Required

Medium Phillips screwdriver

Remove

1. Remove the rear cover.
2. Discharge the CRT if it hasn't already been discharged.
3. Unscrew the two screws securing the AC cord to its metal bracket (Figure 11, #2).
4. Remove the bolt and lockwasher that secure the power cable's green ground wire to the metal chassis (Figure 11, #1) Remove the yellow and green wire next to it as well.
5. Disconnect the AC connector from the main logic board (Figure 11, #3).

Replace

1. Install the two screws that mount the AC cord receptacle to its metal bracket (Figure 11, #2).
2. Install the bolt and lockwasher that secure the power cable's green ground wire to the metal chassis (Figure 11, #1).
3. Connect the connector labelled "AC" to the main logic board (Figure 11, #3).
4. Replace the rear cover.

❑ CATHODE-RAY TUBE (CRT)

CAUTION: *Liquids may damage the funnel's conductive coating. Do not use any liquid cleaner (even water) on the funnel (the portion of the CRT inside the case). Wipe the funnel with a clean dry cloth.*

Materials Required

40-watt soldering iron, solder, and solder sucker
Medium Phillips screwdriver
Sharp diagonal cutters
RTV or silicon glue
Small cable ties

Remove

1. Remove the rear cover.
2. Discharge the CRT.
3. Remove the main logic board.
4. Place the monitor face down on a protective pad (Figure 12).

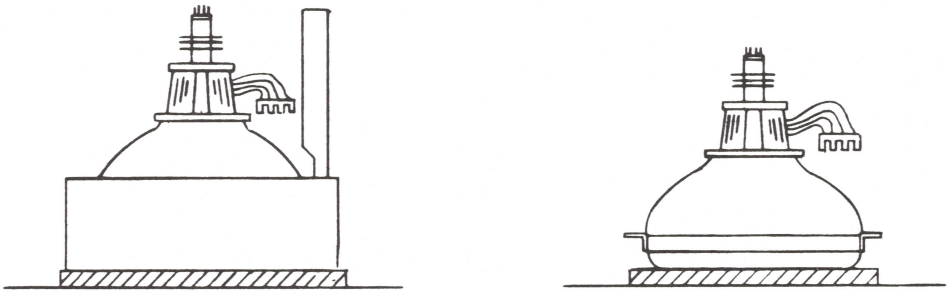


FIGURE 12

5. Locate the degaussing coil (Figure 13, #2). It is braced to the CRT by two plastic holding tabs (Figure 13, #3). Pull the tab strips out of the tab cutouts and bend the strips out to free the degaussing coil. Carefully lift out the coil.

6. Remove the four CRT mounting screws (Figure 13, #1) with the washers.

7. If the top metal CRT mounting bracket gets in the way, remove it.

8. Set the monitor on its base (foot). Firmly grasp the thick part of the base (not the yoke) as you tip the bezel, and carefully slide the CRT out from the front bezel.

9. Remove the silver mesh cable (Figure 13, #5) with the spring attached. Save this cable to use on the replacement CRT.

WARNING: *If you intend to dispose of the CRT, refer to "Disposing of the Cathode-Ray Tube" in Section 1, Basics.*

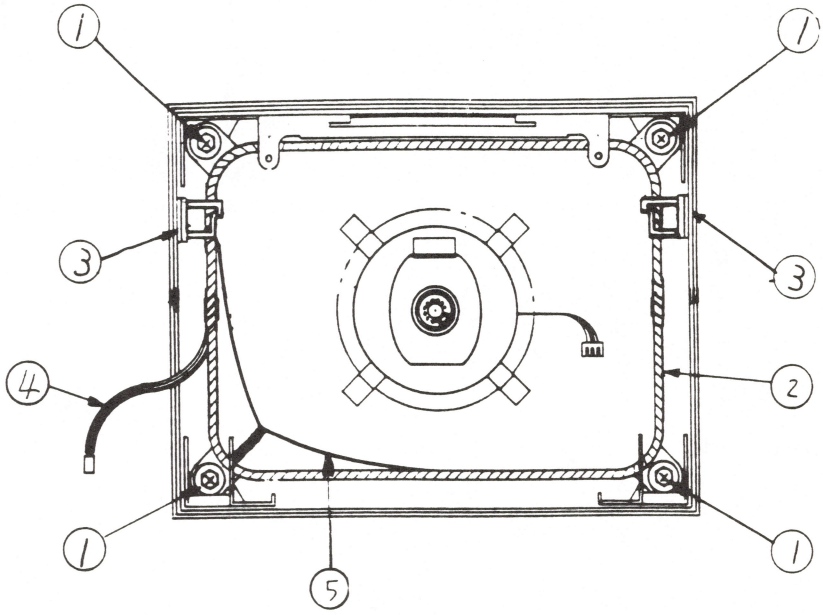


FIGURE 13

Replace

1. Place the front bezel face down on a clean, soft surface.

2. Replace the silver mesh cable (Figure 14, # 5) with the spring attached. Hook the spring to the lower left corner.

3. Replace the metal CRT mounting brackets (top and bottom). Make sure that the triangular plastic mounting piece is installed on the bottom metal bracket and that the LED cable goes out the lower left side of the bezel on the outside of the main logic board tray.

WARNING: *Do not touch the yoke (neck) of the CRT.*

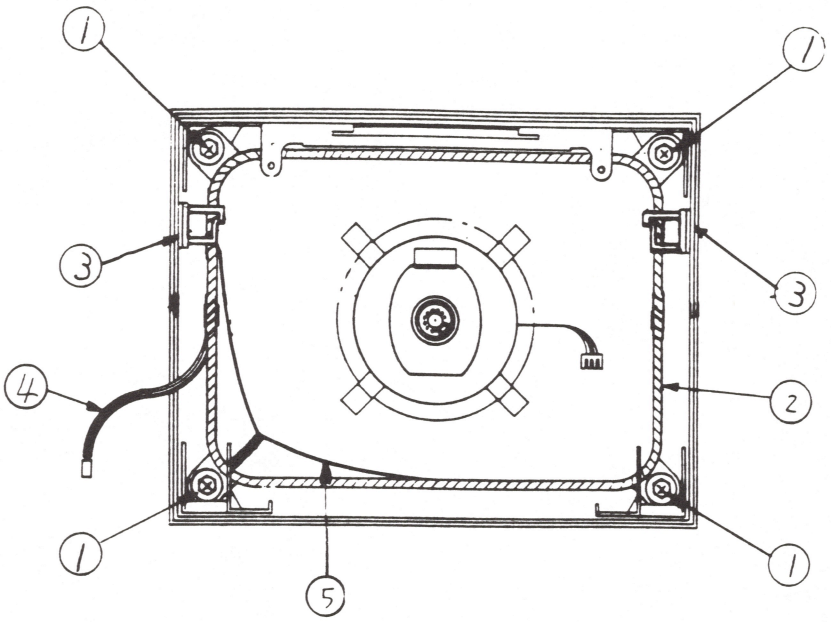


FIGURE 14

4. Carefully set the CRT inside the bezel. It may be necessary to flex the top of the bezel a little to fit the CRT inside of it.

5. Replace the four mounting screws and washers (Figure 14, #1).

6. Replace the degaussing coil (Figure 14, #2) over the CRT so that its connector (Figure 14, #4) is at your left when facing the monitor.

7. Bend the degaussing coil retaining tab strips back into the tab cutouts to secure the degaussing coil.

8. Replace the main logic board.

   Note: Make sure that the black CRT ground wire is positioned up toward the top of the bezel so that when the main logic board is installed the wire will clear the board.

9. Replace the CRT video board.

10. Replace the rear cover.

❑ LED ASSEMBLY

Materials Required

40-watt soldering iron, solder, and solder sucker
Medium Phillips screwdriver
Sharp diagonal cutters
RTV or silicon glue
Small cable ties
Small flatblade screwdriver

Remove

1. Remove the rear cover.
2. Discharge the CRT.
3. Remove the main logic board.
4. Disconnect the LED cable from connector LE on the CRT video board (Figure 15, #1). Cut any cable ties that prevent the cable from being removed from the CRT video board.

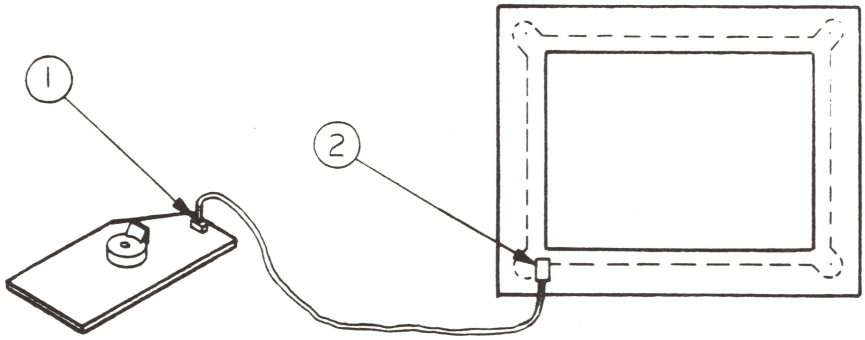


FIGURE 15

5. Remove the CRT.

6. Pull the LED free from the front bezel. If the LED is stuck, use the small flatblade screwdriver to loosen it from its plastic holder. Then bend the retaining arm on the holder very slightly while you pull out the LED.

Replace

1. Position the LED assembly in the plastic holder so that its wires point toward the nearest corner (Figure 15, #2).

2. Replace the CRT.

3. Replace the main logic board.

4. Replace the CRT video board.

5. Connect the LED cable to its connector on the CRT video board (Figure 15, #1).

6. Replace the rear cover.

❑ MAIN LOGIC BOARD FUSE

Materials Required

Medium Phillips screwdriver (6-inch shaft)
Fuse puller

Replacing Fuse 901

1. Remove the rear cover.
2. Discharge the CRT.
3. Locate fuse F901. It is mounted to the component side of the main logic board (Figure 16, #1).

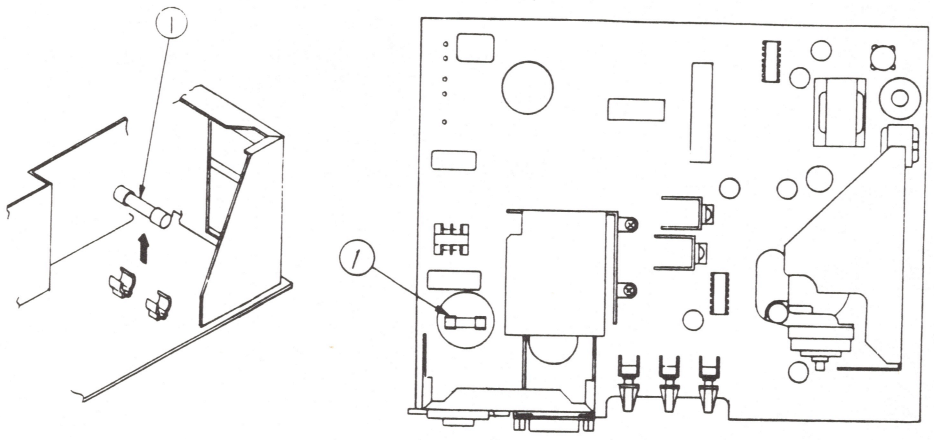


FIGURE 16

4. Check fuse F901. If it is blown, replace it with a new one.

CAUTION: *Do not try to slide the fuse sideways. You may break the fuse holder.*

5. Replace the rear cover.

Apple Technical Procedures

AppleColor RGB Monitor

Section 3 – Adjustments

❑ CONTENTS

3.3 Introduction
3.3 Important Safety Tips
3.4 Pre-Adjustment Set-Up Procedure
3.7 Vertical Adjustments
3.7 Horizontal Adjustments
3.9 Linearity Adjustments
3.9 Focus Adjustments
3.11 Color Adjustments

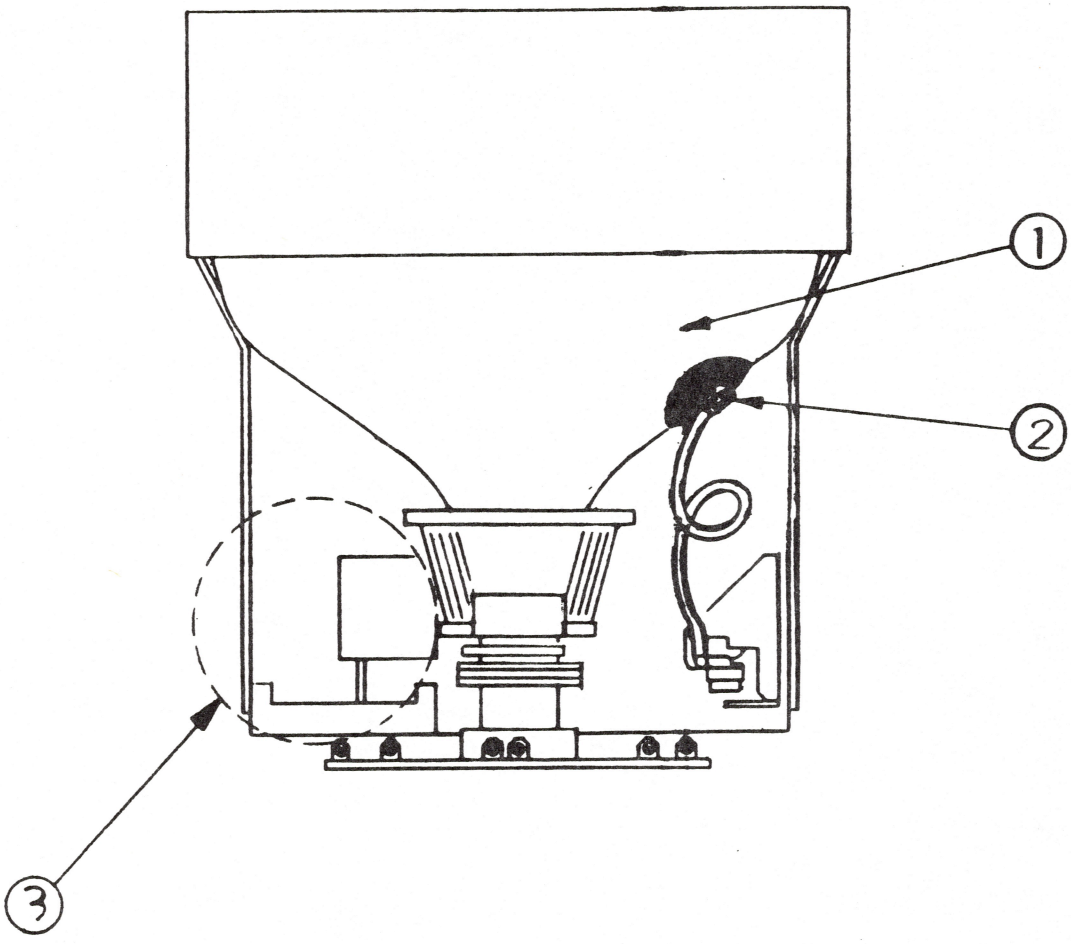


FIGURE 1

❑ INTRODUCTION

Check Adjustments First

If you are unsure which adjustments to perform, perform the Check Adjustments procedure in the "Troubleshooting" section first.

Adjust Color Only When Necessary

Do not change the internal color adjustments if the color quality is within acceptable range! Perfect color adjustments require special equipment. The color adjustments in this section will only allow you to achieve an acceptable level of color production in those rare cases where adjustment is necessary.

Do Not Adjust the Yoke

All yoke adjustments have been preset by the manufacturer. Do not attempt to make any tilt, ring, or geometric adjustments on the ColorMonitor. If the monitor cannot be corrected using the following procedures, use the Troubleshooting Table found in the "Troubleshooting" section to isolate the faulty module.

Important Safety Tips

***WARNING**: Read and follow the safety instructions below. Failure to follow them could result in electrical shock.*

Safety Instructions

1. During these adjustments your hand will come close to extremely high voltages on the tube, anode, anode lead, and in the power supply area (Figure 1, #1, #2, and #3). Avoid touching these parts.

2. Use only one hand to make all adjustments! Never touch the chassis while making adjustments.

3. Use only a three-prong grounded electrical outlet installed by a qualified electrician, and do not under any circumstances use an adapter plug.

4. Do not attempt to make any adjustments on the monitor other than those directed herein, and do those with extreme caution.

5. Read and follow the Safety Precautions in the Basics section for this product.

❑ PRE-ADJUSTMENT SET-UP PROCEDURE

Materials Required

AppleColor RGB Monitor
Apple IIGS™ computer with a disk drive connected
Apple® IIe, IIc, IIGS Diagnostic 1.0 (3.5) diskette or
Apple IIGS Diagnostic 1.0 (5.25) diskette
8 inch (or longer) plastic alignment tool (tweaker)
Mirror with prop (for viewing screen during adjustments)
12 inch ruler

Set-up

1. To see if an adjustment is necessary and to obtain the proper test pattern displays for each adjustment, perform the Adjustments Check in the Troubleshooting Section.

2. Turn the monitor off, disconnect the power cord and computer video cable and remove the rear cover. (See "Rear Cover" in the Take-Apart section.).

3. Remove the switch panel from the rear cover leaving the on/off switch and brightness and contrast controls installed on the panel. (See "Switch Panel Controls" in the Take-Apart section.)

4. Set the monitor on its feet and install connector S3 from the switch panel to the main logic board and connector VC from the switch panel to the CRT video board.

5. Reconnect the power cord and video cable and turn on the monitor and the computer.

6. After allowing the monitor to warm up for 15 minutes, select a test pattern display appropriate for the desired adjustment from the Apple IIGS Diagnostics Diskette. If unsure which test pattern is necessary or how to display it, refer to the Adjustments Check procedure in the Troubleshooting Section.

7. Prop the mirror in front of the monitor's screen so that you can see its display as you adjust.

8. Adjust the monitor's BRIGHTNESS control (Figure 2, #1) to its detent (click) position.

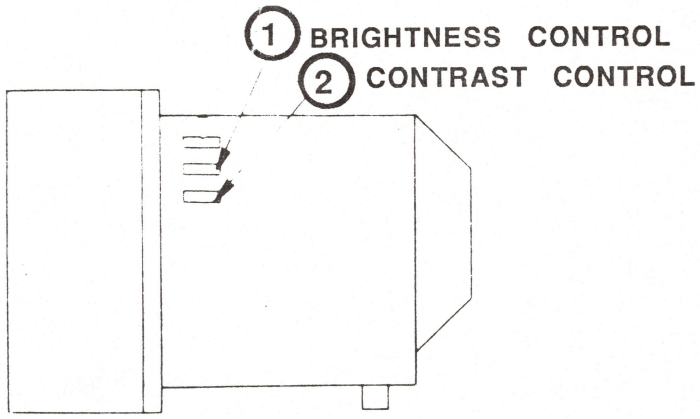


FIGURE 2

9. Adjust the monitor's CONTRAST control (Figure 2, #2) to its maximum clockwise position.

10. Perform the appropriate AppleColor RGB Monitor adjustment.

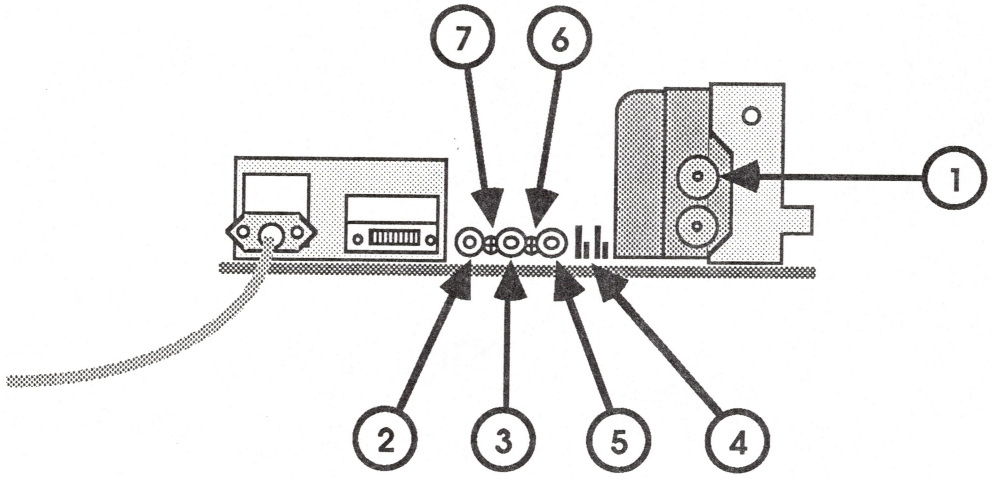


FIGURE 3

❑ VERTICAL ADJUSTMENTS

1. To see if an adjustment is necessary and to obtain the proper test pattern display for this adjustment, perform the Adjustments Check in the Troubleshooting Section .

2. Perform the Pre-Adjustment Set-Up Procedure in this section.

3. Vertical Hold: Set the vertical hold control VR401 (Figure 3, #2) to the mechanical center by turning it all the way to the left, then to the right, then to the center of the range where the picture is locked.

   Turn the monitor off and back on, to make sure the vertical hold is secure.

4. Vertical Height: If the vertical height of the image is incorrect, then adjust V-HEIGHT VR403 (Figure 3, #3) until the height of the active portion of the display is 5 9/10 inches.

5. Vertical Center: If the vertical position of the entire image is off, then adjust VPOS1 and VPOS2 (Figure 3, #4) until the image is centered.

6. Replace the rear cover. (See "Rear Cover" in the Take-Apart section.)

❑ HORIZONTAL ADJUSTMENTS

1. To see if an adjustment is necessary and to obtain the proper test pattern display for this adjustment, perform the Adjustments Check in the Troubleshooting Section .

2. Perform the Pre-Adjustment Set-Up Procedure in this section.

3. Horizontal Hold: If the picture is tearing (not locked), adjust H-HOLD VR502 (Figure 3, #5).

...Continued on next page

4. Horizontal Width: Measure the width of the active portion of the display. Adjust H-WIDTH L552 (Figure 4, #2) for about 7 7/8 inches.

WARNING: *Avoid contact with the anode on the CRT (Figure 4, #1) during this adjustment or personal injury due to electrical shock could result.*

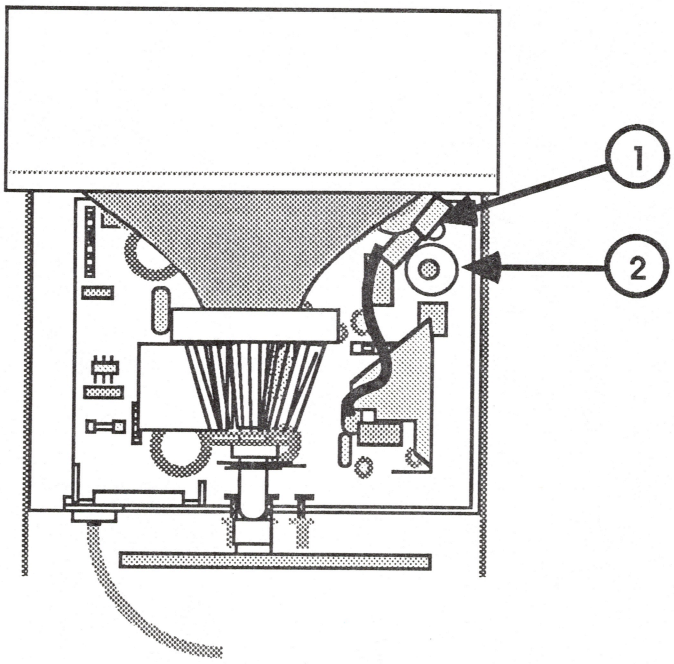


FIGURE 4

5. Horizontal Center: If the image is too far to one side of the screen, adjust H-CENTER VR501 (Figure 3, #6) until the image is centered.

6. Replace the rear cover. (See "Rear Cover" in the Take-Apart section.)

❑ LINEARITY ADJUSTMENTS

1. To see if adjustment is necessary and to obtain the proper test pattern display for this adjustment, perform the Adjustments Check in the Troubleshooting Section.

2. Perform the Pre-Adjustment Set-Up Procedure in this section.

3. VERTICAL HEIGHT: Measure the height of the active portion of the display. Adjust V-HEIGHT VR 403 (Figure 3, #3) for about 5 9/10 inches.

4. Adjust V-LIN VR 402 (Figure 3, #7) so that all the boxes in the display are close to the same size.

5. Replace the rear cover. (See "Rear Cover" in the Take-Apart section.)

❑ FOCUS ADJUSTMENTS

1. To see if an adjustment is necessary and to obtain the proper test pattern display for this adjustment, perform the Adjustments Check in the Troubleshooting Section.

2. Perform the Pre-Adjustment Set-Up Procedure in this section.

3. Locate the focus adjustment on the flyback transformer on the main logic board (Figure 3, #1).

4. Adjust the FOCUS control for optimum focus in the 80 column text display.

5. Turn off the monitor and the computer and disconnect the video cable and power cords.

6. Replace the rear cover. (See "Rear Cover" in the Take-Apart section.)

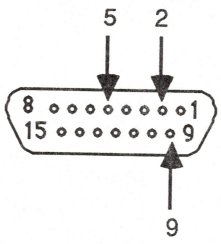


FIGURE 5

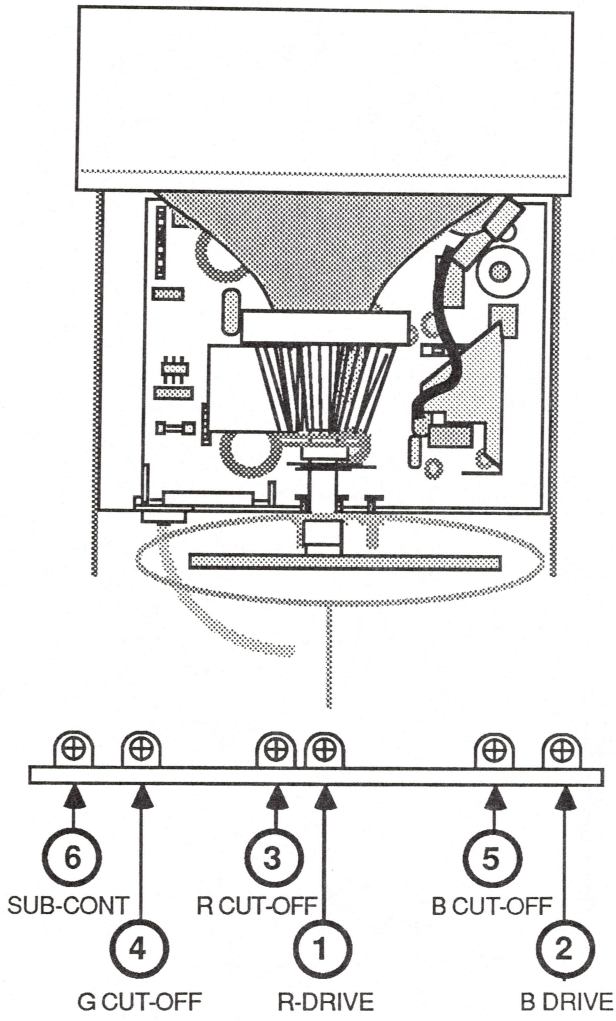


FIGURE 6

❑ COLOR ADJUSTMENTS

Materials Required

A modified AppleColor RGB Monitor cable with pins 2, 5, and 9 cut or removed (Figure 5). (These pins carry external RGB video signals from the computer to the monitor. Cutting them prevents the external video from interfering with the static internal color adjustments described below.)

Adjustment Procedure

1. Make sure a normal (unmodified) cable is installed. To see if an adjustment is necessary, perform the Adjustments Check in Section 4, Troubleshooting.

2. Perform the Pre-Adjustment Set-Up Procedure in this section.

***WARNING**: The main logic board has extremely high voltages. Use the insulated tool in one hand only, and watch what you are touching!*

---

3. Turn the monitor off, install the modified cable (see Materials Required, above), and turn it back on.

***CAUTION**: Do not make any adjustments to the SUBCONTRAST control (Figure 6, #6).*

---

4. Using the plastic alignment tool or insulated screwdriver, turn the following controls counterclockwise as far as possible:

   - R-DRIVE (red) - Figure 6, #1
   - B-DRIVE (blue) - Figure 6, #2
   - R-CUTOFF (red) - Figure 6, #3 (bias control)
   - G-CUTOFF (green) - Figure 6, #4 (bias control)
   - B-CUTOFF (blue) - Figure 6, #5 (bias control)

   ***Note**:* There is no drive adjustment for green.

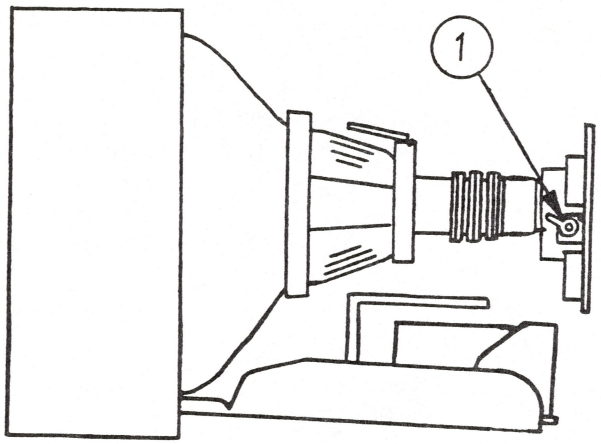


FIGURE 7

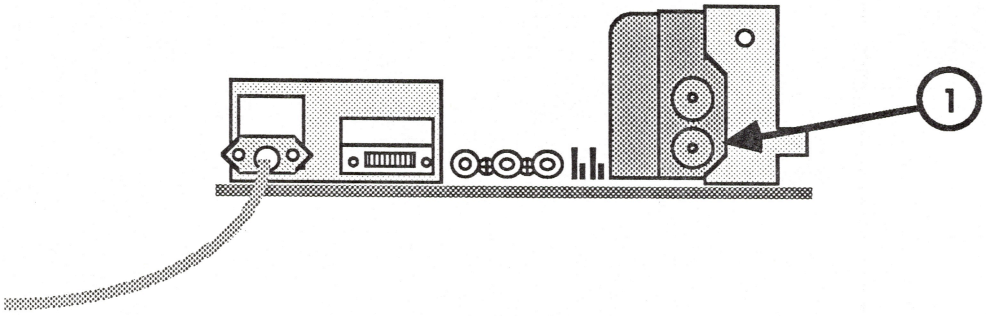


FIGURE 8

5. Position the SERVICE switch lever up (Figure 7, #1) to display a horizontal line.

6. Adjust the SCREEN control (Figure 8, #1) for a faint display. The hue of the line must be white (neutral). No red, blue, or green should be visible. If the line is white, skip to step 9. If a predominant color is present within the horizontal line, go to step 7.

7. Adjust the CUTOFF controls that correspond to the predominant color until the horizontal line is a neutral white. The controls are:

   - R-CUTOFF (red) - Figure 9, #3 (bias control)
   - G-CUTOFF (green) - Figure 9, #4 (bias control)
   - B-CUTOFF (blue) - Figure 9, #5 (bias control)

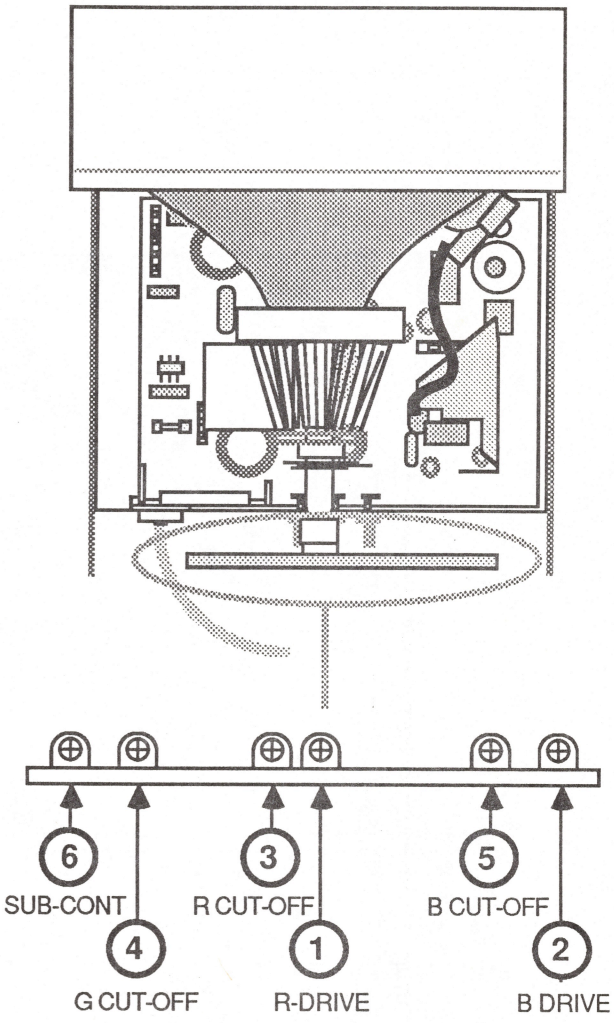


FIGURE 9

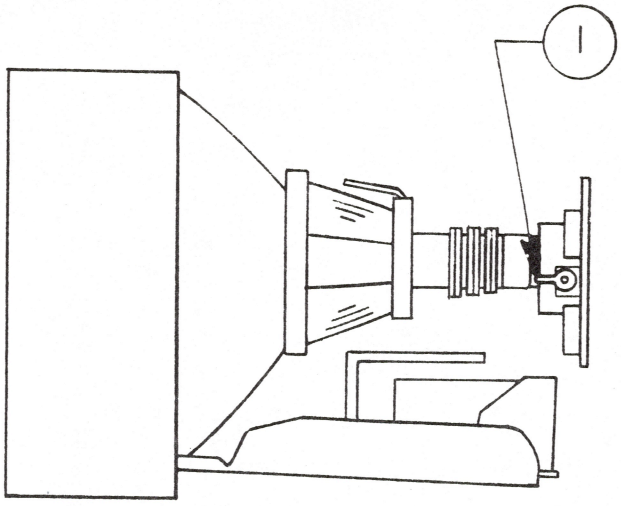


FIGURE 10

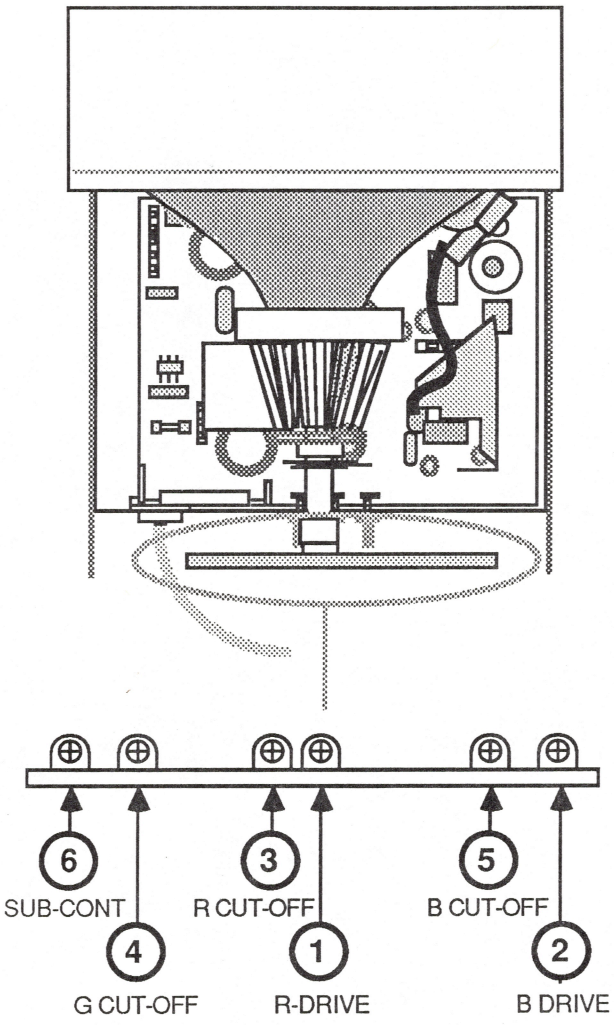


FIGURE 11

8. Set the SERVICE switch (Figure 10, #1) back to its original position (level) with the lever pointing directly toward the back of the monitor.

9. Install an unmodified AppleColor RGB cable between the monitor and the computer.

10. To select a white screen at the computer:

    a) Remove the boot disk and power on the computer. The screen should display a **Check startup device** prompt.

    b) Press <Control>-<Open Apple>-<Escape> simultaneously to gain access to the **Desk Accessories** screen.

    c) Use the keyboard arrows to select **Control Panel** and press <Return>.

    d) Select **Display** and press <Return>.

    e) At the **Display** screen select the following:

        1) Text: Black
        2) Background: White
        3) Border: White
        4) Press <Return>.

    f) Simultaneously press <Control>-<Escape> and <Reset> (at the top of the keyboard) to get to the blinking AppleSoft prompt.

    g) Type HOME and press <Return>. The cursor should be positioned in upper left corner of the screen. The rest of the display should be white.

11. The video signals from the computer may have changed the colors in the display. Adjust the DRIVE controls that correspond to the predominant color until the white in the screen is a neutral white and the text is black. The controls are:

    - R-DRIVE (red) - Figure 11, #1
    - B-DRIVE (blue) - Figure 11, #2

    Note: There is no drive adjustment for green.

12. If the colors won't adjust, redo this procedure from the beginning.

13. Perform the Adjustments Check in Section 4, Troubleshooting, to see if the adjustments are correct.

14. Turn off the monitor and the computer, and disconnect the video cable and power cords.

15. Replace the rear cover. (See "Rear Cover" in Section 2, Take-Apart.)

Apple Technical Procedures

AppleColor RGB Monitor

Section 4 – Troubleshooting

❑ CONTENTS

4.2 Introduction
4.2 Important Terms
4.2 Directions
4.3 Adjustments Check Procedure
4.3 Set-Up
4.4 To Select a Test
4.4 To Deselect a Test
4.4 Perform Adjustment Checks
4.5 Geometric Display Checks
4.6 Focus Check
4.6 Color Check
4.7 Troubleshooting Table

❑ INTRODUCTION

This troubleshooting section consists of a symptom chart showing each symptom and a list of fixes.

Important Terms

There are two parts to the display on a monitor:

Video
Video is the information (characters, graphics, etc.) on the display. The video is usually displayed over the raster (described below) so that the raster is not visible.

Raster
The raster is the lit portion of the screen. When the raster is displayed by itself with no video, it looks like a blank white box.

Directions

First, go through the Adjustments Check in this section and refer to the Adjustments section to perform any necessary adjustments.

If adjustments didn't fix the problem, go to the Troubleshooting Table beginning on the page following the Adjustments Check and find the symptom which most closely resembles that exhibited by the defective monitor. Then try the recommended action(s) in the order listed.

If the problem still exists after trying the actions listed in the Troubleshooting Table, contact your Regional Technical Support Center for assistance.

❑ ADJUSTMENTS CHECK PROCEDURE

Materials Required

AppleColor RGB Monitor
Apple IIGS computer with disk drive connected
Apple IIe, IIc, IIGS Diagnostic 1.0 (3.5) diskette or Apple IIGS Diagnostic 1.0 (5.25) diskette

Set-Up

1. Allow the monitor to warm up for at least 15 minutes.

2. Adjust the BRIGHTNESS control (Figure 1, #1) to its detent (click) position.

3. Adjust the CONTRAST control (Figure 1, #2) to its maximum clockwise position.

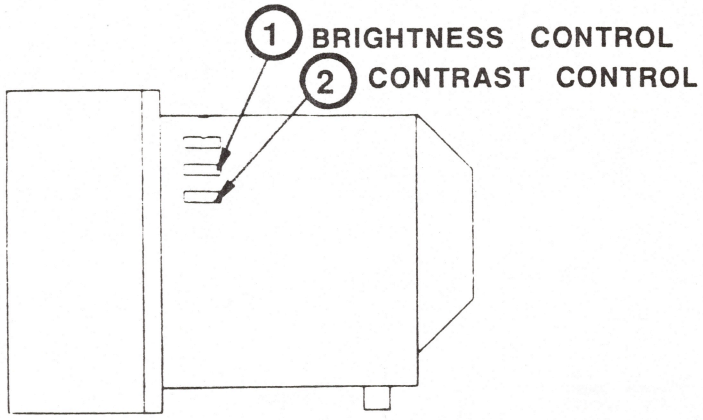


FIGURE 1

4. Install the Apple IIGS Diagnostics Diskette into the computer's drive and start up the program.

...Continued on next page

To Select a Test

1. Select **Choose Tests** from the main menu and press <Return>.
2. Select **Video Pattern Tests** from the **Choose Tests** menu and press <Return>.
3. Select the desired test from the **Video Pattern Tests** menu and press <Return>. The number "1" should appear beside the test.
4. Press the <Escape> key **twice** to return to the main menu.
5. Select **Execute Selected Tests** from the main menu and press <Return>. The desired test pattern screen should now display on the monitor.

To Deselect a Test

1. Press <Escape> **twice** to return to the main menu.
2. Select **Choose Tests** from the main menu and press <Return>.
3. Select **Video Pattern Tests** from the **Choose Tests** menu and press <Return>.
4. Select the previously selected test from the **Video Pattern** Tests menu and press <Delete>. The number "1" should disappear.
5. Press <Escape> **twice** to return to the main menu.

Perform the Adjustment Checks

Perform the checks on the following pages. If a check indicates a need for an adjustment, refer to the Adjustments section for the adjustment procedure.

Geometric Display Checks

1. Select the "Super HiRes" test pattern display. (Refer to To "Select a Test" in this procedure if instructions are necessary.)

   Note: The screen should now display a series of "horizontal and vertical lines crossing each other to form boxes.

2. Use the guidelines below to determine what adjustment to make.

Vertical Check

   a) Refer to "Vertical Adjustments" in the Adjustments section if:

   - the grid boxes in the top and bottom rows do not have about the same height.
   - the square grid boxes are stretched out or compressed vertically.
   - the picture is rolling.
   - the image is pushed to the top or bottom.

Horizontal Check

   b) Refer to "Horizontal Adjustments" in the Adjustments section if:

   - the width of the grid boxes on both sides of the screen is not about the same.
   - the square grid boxes are stretched out or compressed horizontally.
   - the picture is tearing (appears ripped).
   - the picture is pushed more to one side of the screen than the other.
   - the picture is rolling in a diagonal movement on the horizontal plane.

Linearity Check

   c) Refer to the "Linearity Adjustment" in the Adjustments section if the grid boxes are not all the same size.

3. Deselect the "Super HiRes" test pattern display.

Focus Check

1. Select the "80 Col. Text" test pattern display. (Refer to "To Select a Test" in this procedure if instructions are necessary.)

   Note: The screen should now display horizontal rows of a characters and numbers.

2. Refer to the "Focus Adjustment" in the Adjustments section if the characters on the display screen are not focused correctly.

3. Deselect the "80 Col. Text" test pattern display.

Color Check

1. Select the "Color Bars" test pattern display. (Refer to "To Select a Test" in this procedure if instructions are necessary.)

   Note: The screen should now display vertical color bars.

2. Refer to "Color Adjustments" in the Adjustments section if the color is not correct.

3. Deselect the "Color Bars" test pattern display.

❑ TROUBLESHOOTING TABLE

Symptom	Action
• *Power On LED is Off*	1. Make sure that the power cord is plugged into a live power outlet. 2. Replace the LED assembly. 3. Replace the AC cord assembly. 4. Replace the main logic board. 5. Replace the CRT video board. 6. Replace the ON/OFF Switch. 7. Replace the CRT.
• *Power On LED is on but raster is not displayed*	1. Make sure that the computer connection is secure. 2. Adjust the external BRIGHTNESS control on the front panel. 3. Adjust the Contrast Control. 4. Check fuse F901 on the main logic board. Replace if blown. 5. Check that all connectors are secure on the main logic board and the CRT video board. 6. Replace the main logic board. 7. Replace the CRT video board. 8. Replace the CRT.
• *One horizontal line appears*	1. Check to make sure that the internal service switch (S691) is in NORMAL position (pointing horizontally towards the back of the monitor). Refer to the Color Adjustments procedure (in "Adjustments" section) for switch location. 2. Check the yoke connector. 3. Replace the main logic board. 4. Replace the CRT.
• *One vertical line appears*	1. Check yoke connector. 2. Replace the main logic board. 3. Replace CRT.
• *One side of the raster is a different height than the other (keystone effect)*	- Replace the CRT.

Symptom	Action
• *Abnormal raster*	1. Check to make sure all connectors are installed correctly on the boards. 2. Replace the main logic board.
• *Horizontal linearity won't adjust*	- Replace the main logic board.
• *Monitor makes high pitched noise*	1. Replace the main logic board. 2. Replace the power supply board.
• *Raster is small and abnormally bright*	1. Check the yoke connector. 2. Replace the main logic board. 4. Replace the CRT video board 5. Replace the CRT.
• *No vertical synchronization*	1. Adjust the VERTICAL HOLD control on the back panel. 2. Replace the main logic board.
• *Raster won't center*	- Replace the main logic board.
• *Can't adjust color, contrast, brightness, etc.*	1. Replace the main logic board. 2. Replace the CRT video board.
• *Characters jitter*	1. Make sure all ground straps are secure. 2. Verify that adjacent computer equipment is properly grounded. 3. Replace the power supply board. 4. Replace the main logic board. 5. Replace the CRT video board.
• *Vertical linearity won't adjust*	- Replace the main logic board.
• *Black spot remains when unit is off. (burnt phosphor)*	1. Replace the CRT. 2. Replace the main logic board.

Symptom	Action
• *Picture too dark or too bright*	1. Adjust the external BRIGHTNESS control 2. Replace the main logic board. 3. Replace the CRT video board.
• *Out of focus*	- Replace the main logic board.
• *Raster is one predominant color*	1. Replace the main logic board 2. Replace the CRT video board.
• *No color*	1. Make sure that the software is supposed to display in color. 2. Replace the CRT video board. 3. Replace the main logic board.
• *Monitor turns itself off*	- Replace the main logic board.
• *Flashing or wavy screen*	- Gently crimp the metal connector tabs on the video connector.

Apple Technical Procedures

AppleColor RGB Monitor

Section 5 – Illustrated Parts List

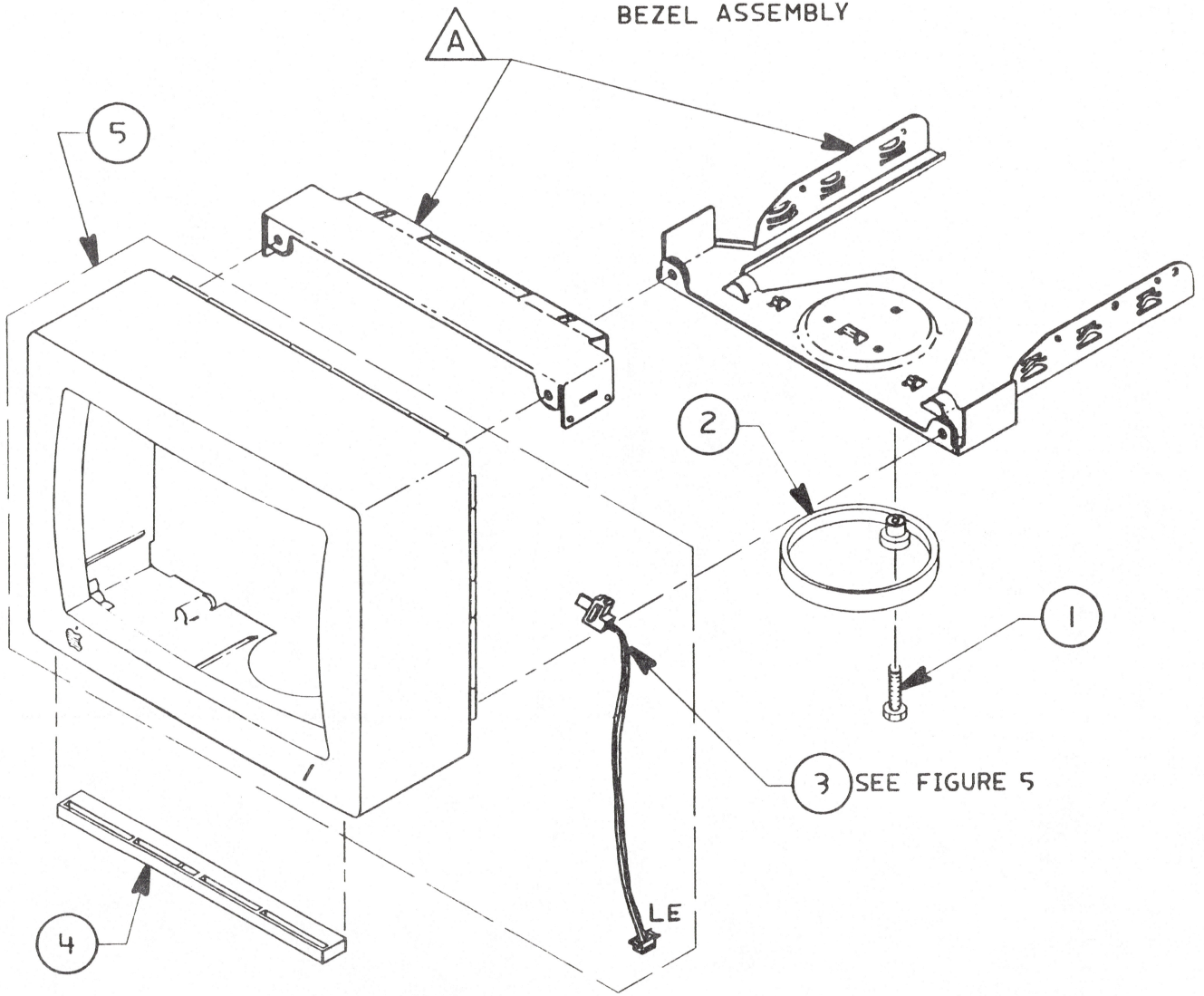
❑ CONTENTS

5.3 Bezel Assembly (Figure 1)
5.5 CRT (Figure 2)
5.7 Power Supply, Video Board (Figure 3)
5.9 Rear Cover and Controls (Figure 4)
5.11 Cables and AC Cord (Figure 5)

The figures and lists in this section include all piece parts that can be purchased separately from Apple for the AppleColor RGB Monitor, along with their part numbers. These are the only parts available from Apple. Refer to your *Apple Service Programs Manual* for prices.

FIGURE 1

BEZEL ASSEMBLY



❑ RGB MONITOR – BEZEL ASSEMBLY (Figure 1)

Item	Part No.	Description
1	956-0003	Screw/Knob Set, AppleColor RGB (See also Figures 2, 3, and 4)
2	949-0057	Bottom Plate, Monitor
3	930-0004	LED Assembly, AppleColor RGB (See Figure 5.)
4	949-0056	Front Foot, Monitor
5	949-0054	Bezel Assembly, AppleColor RGB

Note: The items marked *A* are not available from Apple. If a new bezel is required, these parts must be retained from the old bezel and reinstalled in the replacement bezel.

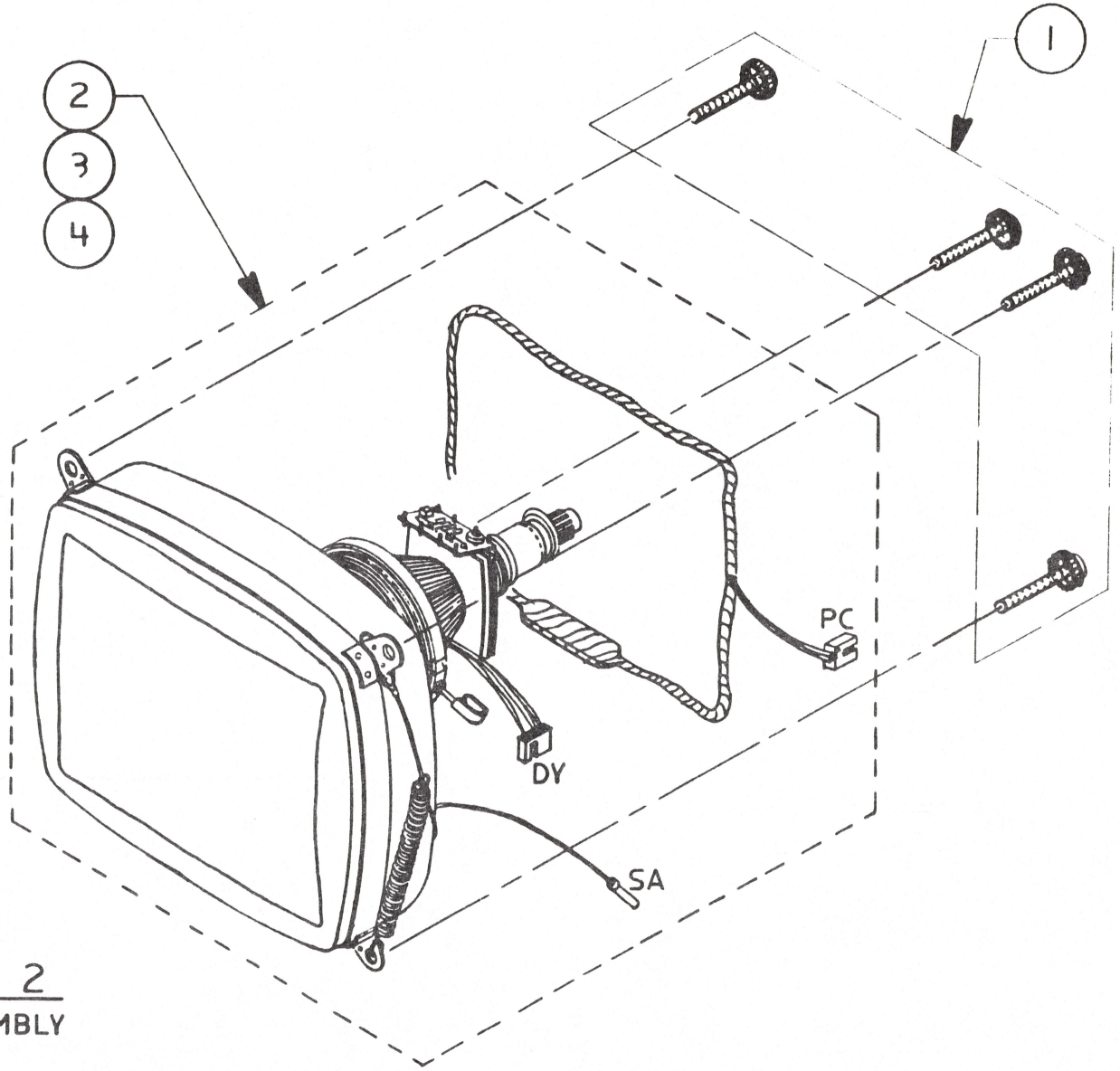


FIGURE 2
CRT ASSEMBLY

❑ RGB MONITOR – CRT (Figure 2)

Item	Part No.	Description
1	956-0003	Screw/Knob Set, AppleColor RGB (See also Figures 1, 3, and 4)
2	076-0207	CRT Assembly, AppleColor RGB, 110v
3	076-0232	CRT Assembly, AppleColor RGB, 220v
4	076-0233	CRT Assembly, AppleColor RGB, 240v

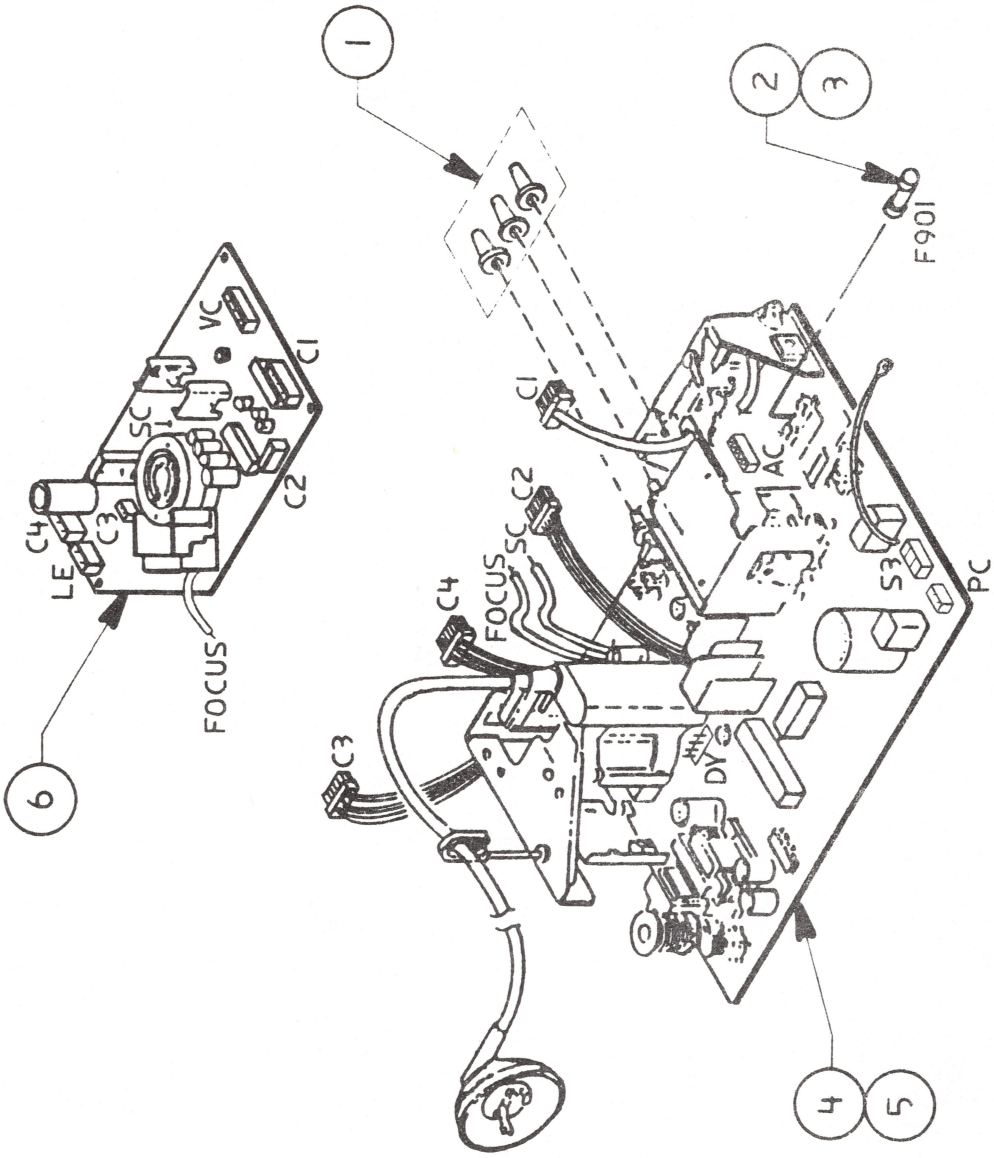


FIGURE 3
PCB'S

❑ RGB MONITOR – POWER SUPPLY, VIDEO BOARD (Figure 3)

Item	Part No.	Description
1	956-0003	Screw/Knob Set, AppleColor RGB (See also Figures 1, 2, and 4)
2	740-0309	Fuse, 3.15 Amp, 110v (F901)
3	740-0061	Fuse, 3.15 Amp, 250v (F901)
4	661-0348	AppleColor RGB Power Supply Board, 110v
5	661-0358	AppleColor RGB Power Supply Board, 220/240v
6	661-0347	AppleColor CRT Video Board

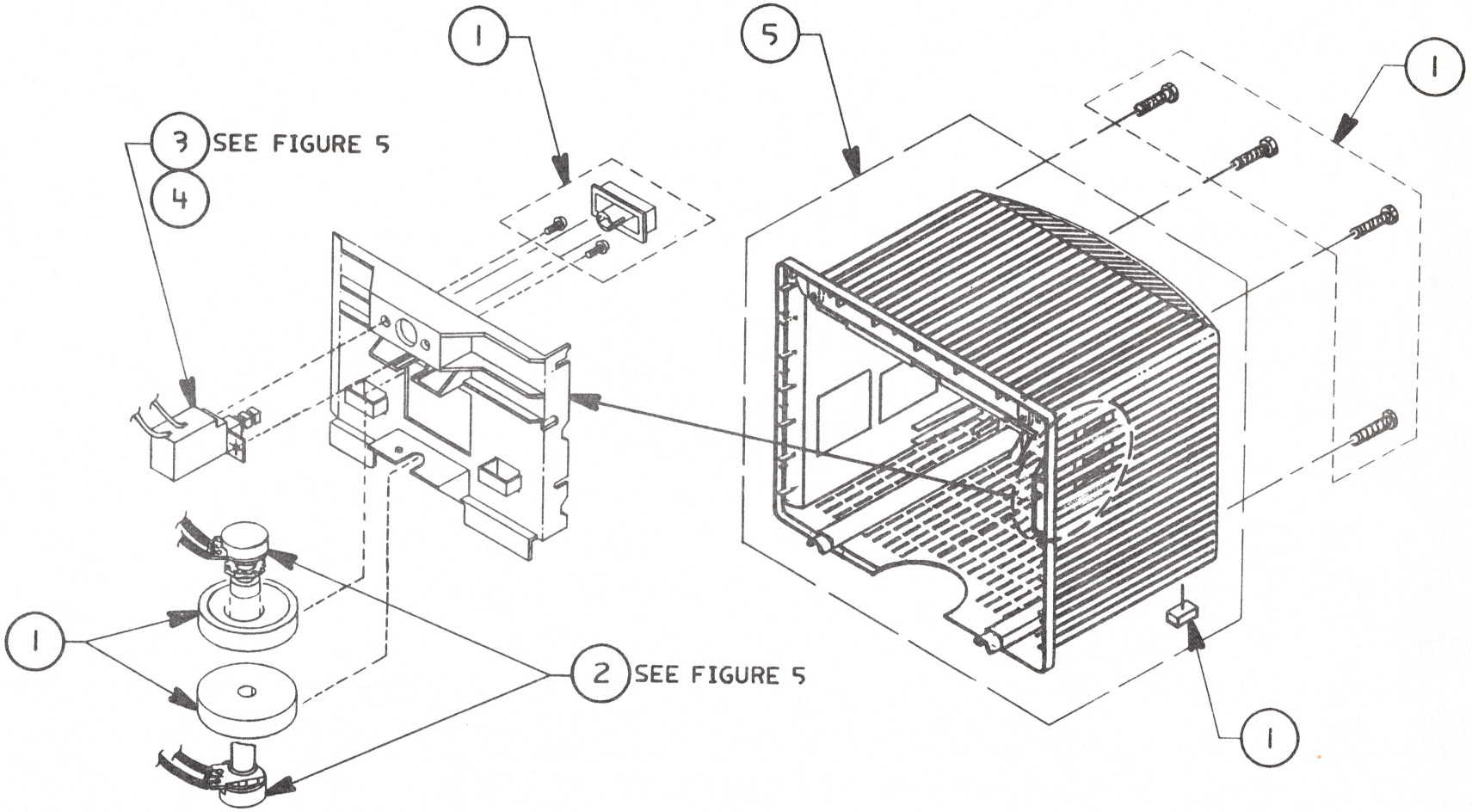


FIGURE 4
REAR COVER ASSEMBLY

❑ RGB MONITOR – REAR COVER AND CONTROLS (Figure 4)

Item	Part No.	Description
1	956-0003	Screw/Knob Set, AppleColor RGB (See also Figures 1, 2, and 3)
2	905-0001	Contrast/Brightness Control, AppleColor RGB
3	937-0014	On/Off Switch Assembly, AppleColor RGB, 110v
4	937-0015	On/Off Switch Assembly, AppleColor RGB, 220/240v
5	949-0055	Rear Cover, AppleColor RGB

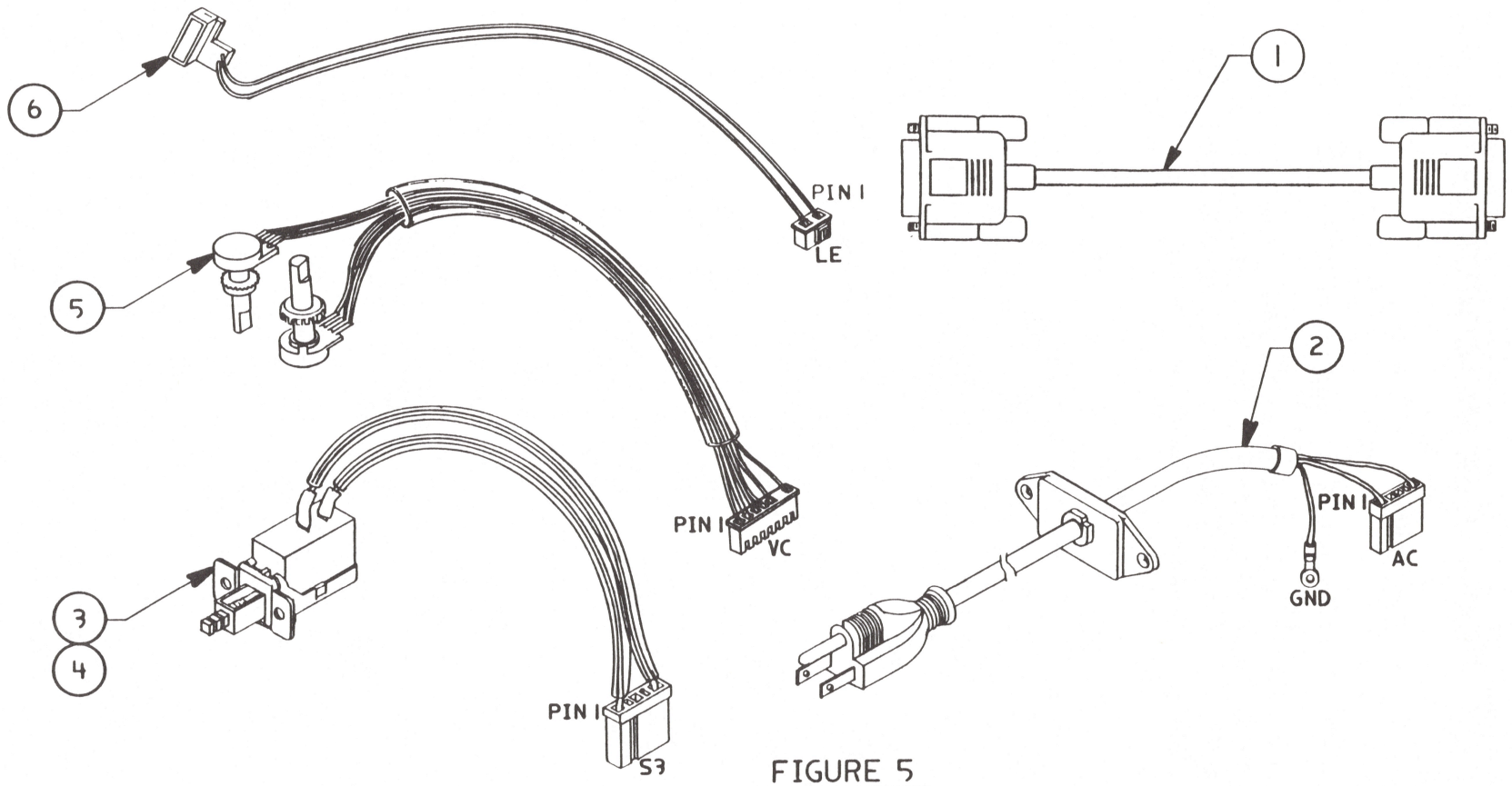


FIGURE 5

❑ RGB MONITOR – CABLES AND AC CORD (Figure 5)

Item	Part No.	Description
1	590-0536	RGB Video Cable
2	935-0002	AC Cord, AppleColor RGB, 110v
3	937-0014	On/Off Switch Assembly, AppleColor RGB, 110v
4	937-0015	On/Off Switch Assembly, AppleColor RGB, 220/240v
5	905-0001	Contrast/Brightness Control, AppleColor RGB
6	930-0004	LED Assembly, AppleColor RGB

Apple Monochrome Monitor

Apple Technical Procedures

Monochrome Monitor

Technical Procedures

❑ TABLE OF CONTENTS

Section 1 – Basics	1.2	Product Description
	1.3	Safety Precautions
	1.3	Safe Electrical Setup
	1.4	CRT Safety Rules
	1.6	Live Adjustment Rules
	1.7	Disposing of the Cathode-Ray Tube (CRT)
Section 2 – Take-Apart	2.3	Rear Cover
	2.5	Discharging the Cathode Ray Tube (CRT)
	2.7	Main Logic Board, Switch Case, and AC Cord
	2.15	Transformer
	2.17	Cathode Ray Tube (CRT)
	2.19	Fuse
	2.20	Power Switch
	2.21	Contrast Control
	2.23	LED Assembly
	2.24	Bezel
Section 3 – Adjustments	3.3	Introduction
	3.4	Important Safety Tips
	3.5	Pre-Adjustment Set-Up Procedure
	3.5	Materials Required
	3.7	Adjustments
	3.7	Materials Required
	3.7	Sub-Brightness
	3.9	Horizontal Hold
	3.9	Focus
Section 4 – Troubleshooting	4.2	Introduction
	4.2	Monochrome Monitor Symptom Chart

Section 5 – Illustrated Parts List

5.3 Rear Cover Assembly (Figure 1)
5.5 CRT, Main Logic Board, and Transformer (Figure 2)
5.7 Bezel Assembly (Figure 3)
5.9 Other Parts (Figure 4)

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Apple Technical Procedures

Monochrome Monitor

Section 1 – Basics

❑ CONTENTS

1.2 Product Description
1.3 Safety Precautions
1.3 Safe Electrical Setup
1.4 CRT Safety Rules
1.6 Live Adjustment Rules
1.7 Disposing of the Cathode-Ray Tube (CRT)

❑ PRODUCT DESCRIPTION

The Apple® Monochrome Monitor is a 12-inch CRT display monitor that is used with the Apple II family of computers. The power switch and the contrast control for the Monochrome Monitor are placed as drawn in Figure 1, #1. The LED on the lower front case will show that the power is on. Figure 2 shows the international symbols that identify the other controls and sockets on the back.

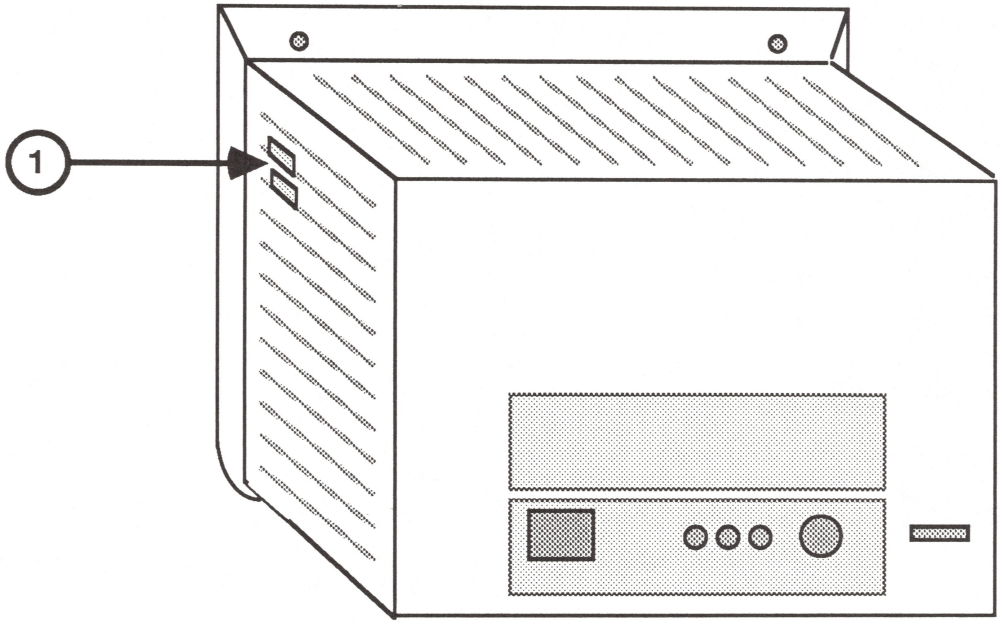

FIGURE 1

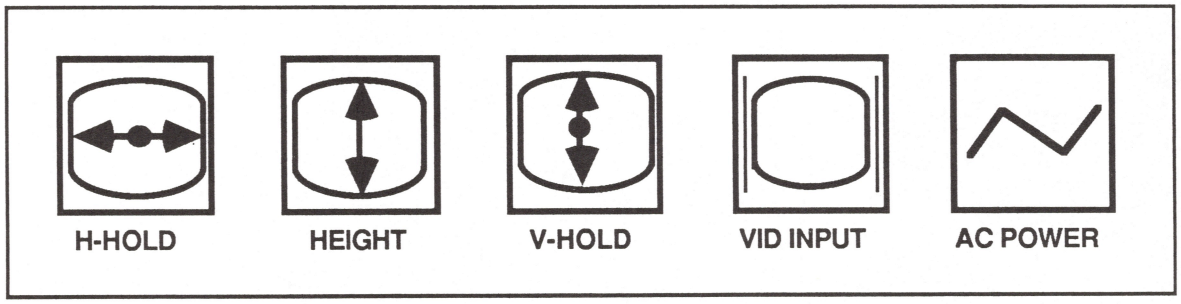

FIGURE 2

❑ SAFETY PRECAUTIONS

The Apple Monochrome Monitor is harmless as long as you're just watching the display. Once you remove the cover, however, you are exposed to the high-voltage Cathode-Ray Tube (CRT)—the picture tube. The following precautions must be taken to ensure your safety, especially when you are making adjustments on a live monitor.

Safe Electrical Setup

- **Be sure your outlet is correctly wired and properly grounded.**

  Polarity and ground testers are available from most electronics stores. Test all outlets in your service shop before working on **any** electrical equipment. If you have any doubts about your building's wiring, consult a qualified electrician.

- **Never use an adaptor plug to connect a monitor's three-prong power plug to a two-prong wall outlet.**

  Adaptors defeat the ground pin, which is a safety feature.

- **When performing live adjustments, use an isolation transformer between the monitor and the outlet.**

  Order an isolation transformer from your electronics distributor, and make it a practice to use it whenever you are working with **any** charged monitor or other powered system under test. An isolation transformer isolates the circuitry of the system under test from the power company's circuitry, thus reducing the likelihood of a fatal shock should you simultaneously contact high voltage and anything else that is earth-grounded.

  Do not connect more equipment to the transformer than the wattage capacity of the transformer will bear. (It is usually best to connect only one piece of equipment at a time.) We recommend an isolation transformer with a minimum wattage capacity of 500 VA, with grounded three-prong cord and receptacle. Two such transformers, available from many electronics stores and distributors, are listed below:

  Triad N-57M Stancor GIS 500

CRT Safety Rules

- **Do not work on a monitor alone.**

  If there is an accident, it could save your life to have someone else nearby. Apple recommends that your staff be trained in cardio-pulmonary resuscitation (CPR).

- **Remove rings, wristwatches, bracelets, hanging necklaces, and other jewelry before performing repairs on a monitor.**

  Metal jewelry is an excellent conductor of electricity. Removing jewelry will reduce the possibility of electric shock.

- **Never use a grounding wriststrap or heelstrap or work on a grounded workbench mat when discharging a monitor or when performing live adjustments.**

  Grounding wriststraps, heelstraps, and mats are used to protect sensitive components from the damaging effects of electrostatic discharge from your own body or clothing. Even though they contain a one-megohm resistor and are designed to conduct only small electrical charges, we recommend that they be used **only** when working on "dead" (uncharged) equipment.

- **Wear safety goggles when working with a CRT.**

  The CRT contains a high vacuum. If cracked or broken, it can implode (collapse into itself), then explode. To protect your eyes from serious injury, always wear safety goggles when working on or near a CRT, and be careful of other people in the area.

- **Before working inside a monitor, turn off the power and disconnect the AC power cord.**

  Certain parts of a monitor chassis are **hot** (electrified) when the monitor is under power. Except when you **must** have the power on (for example, when making live adjustments), never work on a plugged-in monitor—even if you have the power turned off.

- **Keep one hand in your pocket or behind your back when working on a live monitor.**

  This practice reduces the risk of current passing through your heart, should you accidentally contact high voltage.

- **Always discharge the anode before touching anything inside the monitor.**

  High voltage (approx. 12,000 volts DC) can be present on the anode (Figure 3, #1) and other components—even when power is off. Discharging the anode reduces the risk of injury. (See "Discharging the Cathode-Ray Tube [CRT]" in Section 2, Take-Apart.)

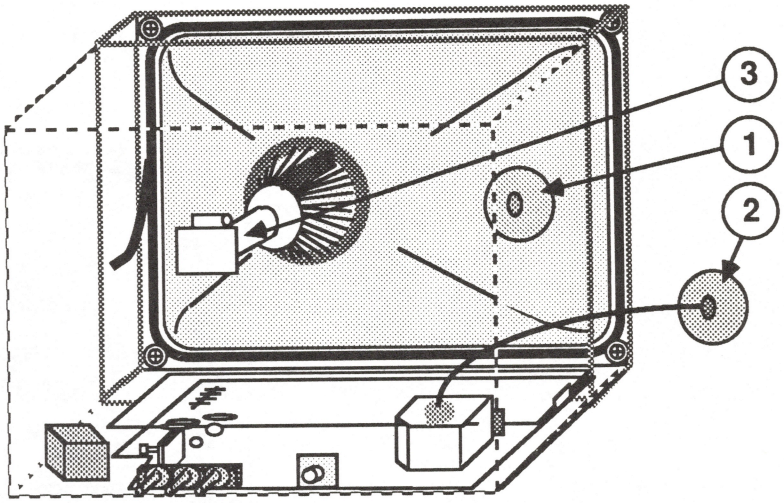

FIGURE 3

- **Never touch the anode connector or the anode aperture.**

  Normally the anode aperture (Figure 3, #1) has a connector plugged into it (Figure 3, #2). When a CRT is replaced, the anode connector is removed, exposing the anode. If the bleeder resisitor fails, the anode can retain a charge of several thousand volts (even when power is off), and can regain some charge even after it has been discharged.

- **Do not pick up or handle a CRT by its neck.**

  To prevent an implosion, you should take every precaution against breaking the tube. Be especially careful with the neck (Figure 3, #3), the area where the tube is the thinnest.

Live Adjustment Rules

In addition to the precautions listed on the previous page, never touch the following components when adjusting a live monitor:

- The yoke wires (Figure 4, #1)
- The anode connector (Figure 4, #2)
- The anode wire (Figure 4, #3)
- The flyback transformer (Figure 4, #4)

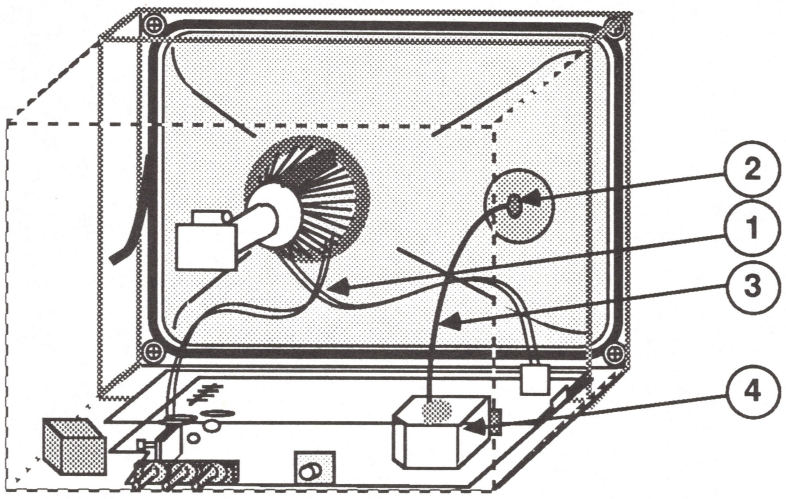

FIGURE 4

WARNING: *Serious injury could result if you touch any of these components with the power on.*

❑ DISPOSING OF THE CATHODE-RAY TUBE (CRT)

Remember that a CRT can implode unless it is devacuumed. Putting a defunct CRT into a trash receptacle without devacuuming it can endanger other people.

Materials Required

Thick cardboard box, large enough to conceal the CRT
Large, sharp, diagonal cutters
Large pliers
Duct tape
Safety goggles
Gardening gloves
12-inch square of cloth or heavy paper

Devacuuming the CRT

1. Put on safety goggles.
2. In the side of the box about six inches from the bottom, cut or drill a hole just large enough to accommodate the very tip of the CRT neck.
3. Place the CRT inside the box with the tip of the neck protruding through the hole, and tape the box flaps down with the duct tape (Figure 5).

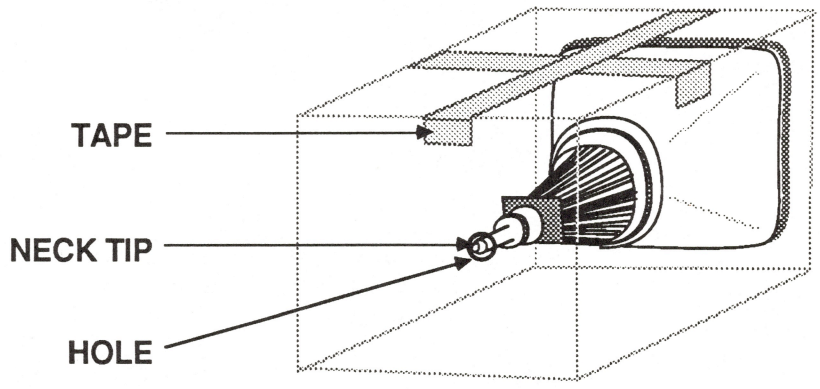

FIGURE 5

WARNING: *Only the very tip of the CRT neck should be protruding through the hole in the box. The box must not have any other openings.*

4. Put on the gloves.

5. If there is a plastic guide on the end of the CRT neck, pull it off. Using the diagonal cutters, carefully clip off the connector pins on the end of the CRT neck.

6. Tape the piece of cloth or paper onto the box (Figure 6, #1) so that it forms a veil over the opening (Figure 6, #2) but allows your hand access to the tip of the CRT. The veil's purpose is to catch bits of glass that may fly during the following step.

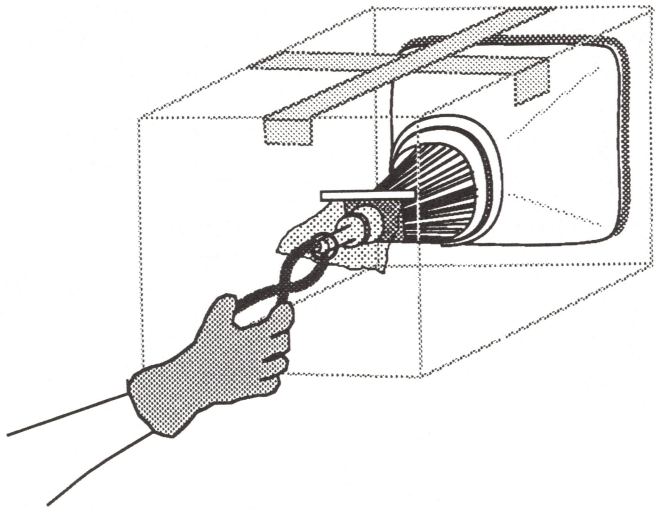

FIGURE 6

7. Make sure no one is standing nearby. Place the pliers under the veil, stand to one side, and look away while you use the pliers to snip off the exposed tip of the CRT.

WARNING: *Do not look directly at the box when cutting off the tip of the CRT!*

Note: You will probably hear a rush of air entering the CRT when the CRT vacuum breaks—but even if you don't, the procedure is complete if the interior of the CRT is clearly visible through the opening created by the removed tip.

Apple Technical Procedures

Monochrome Monitor

Section 2 – Take-Apart

❑ CONTENTS

2.3 Rear Cover
2.5 Discharging the Cathode Ray Tube (CRT)
2.7 Main Logic Board, Switch Case, and AC Cord
2.15 Transformer
2.17 Cathode Ray Tube (CRT)
2.19 Fuse
2.20 Power Switch
2.21 Contrast Control
2.23 LED Assembly
2.24 Bezel

Note: If a step is underlined, detailed instructions for that step can be found elsewhere in this section.

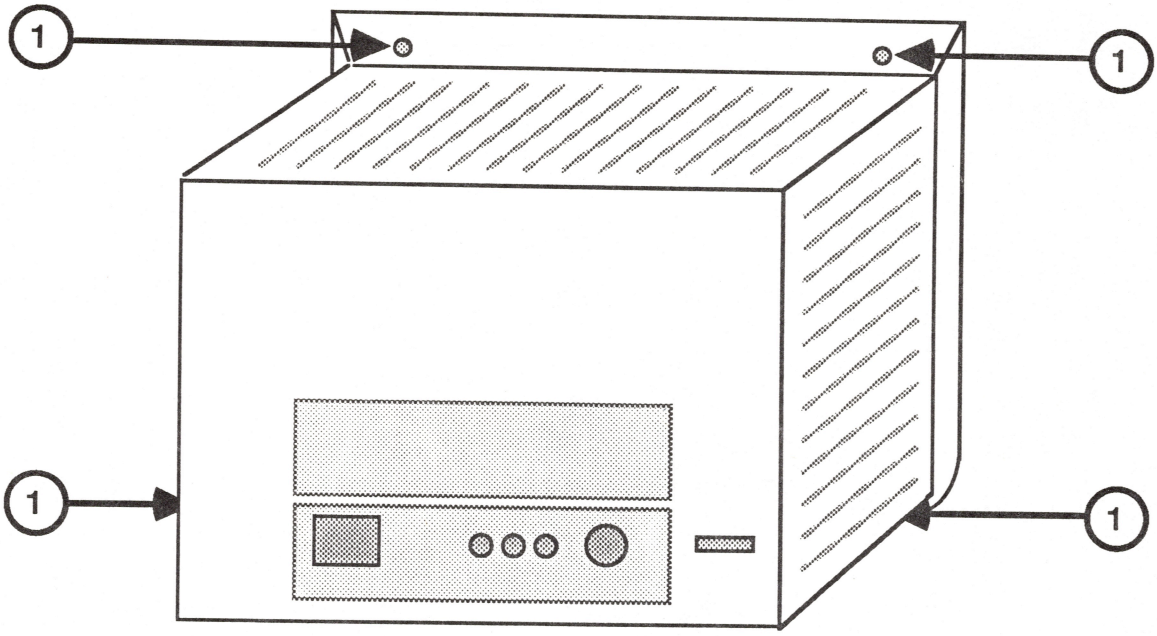

FIGURE 1

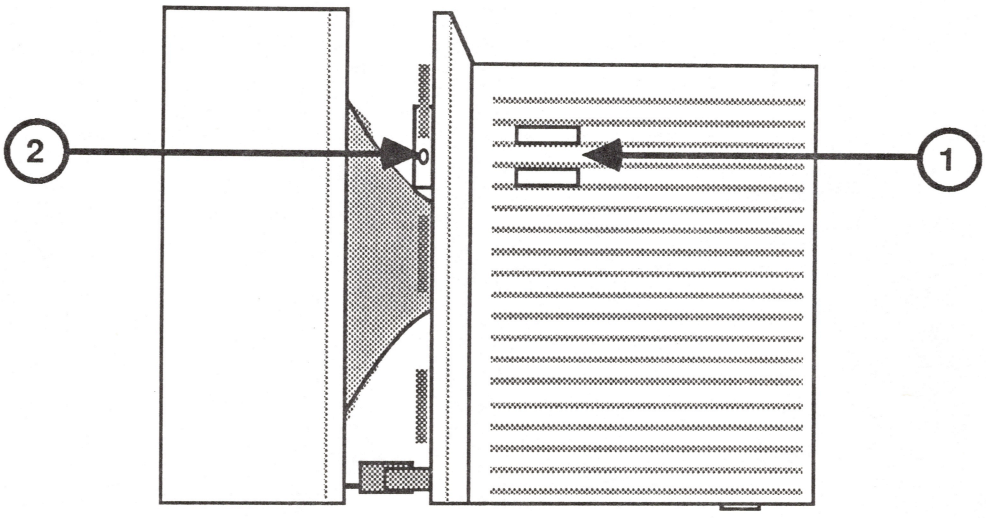

FIGURE 2

❑ REAR COVER

Materials Required

Medium Phillips screwdriver
Safety goggles

Remove

1. Turn off the monitor, disconnect the AC cord from the wall outlet, and disconnect the video cable from the monitor.

2. Place the monitor on its face on a soft surface to avoid damage to the CRT screen.

3. Pull the front foot off the plastic tabs under the bezel.

4. Remove the four Phillips screws (Figure 1, #1).

5. Set the monitor back on its feet, and turn it so that the on-off and brightness switches are toward you (Figure 2, #1).

***CAUTION**: In the next step, separate the rear cover and the bezel gently. The rear cover is attached to the logic board by the wires to the switch case. Both parts could be damaged if separated forcefully.*

6. Gently slide the rear cover an inch or two away from the bezel (Figure 2).

***WARNING:** Avoid touching the CRT in any way, because the CRT is still fully charged.*

7. To separate the bezel from the rear case, first remove the switch case by carefully removing the screw that holds it to the side of the rear cover (Figure 2, #2), and sliding it forward out of the rear cover.

8. Slide the rear cover completely away from the monitor.

   Note: If you are not replacing the main logic board, you may leave the AC cord attached to the main logic board at this time.

Replace

1. Replace the switch case in the rear cover and fasten it with its screw.

2. With the monitor standing, slide the rear cover onto the bezel. If it is difficult to align them, check that the AC cord screw has not forced its mounting plate too far to the left, and that the metal rails of the main logic board assembly are inside the guides on the CRT mounting plate.

3. Replace the four Phillips screws on the rear cover.

4. Push the front foot onto the tabs on the bottom of the bezel.

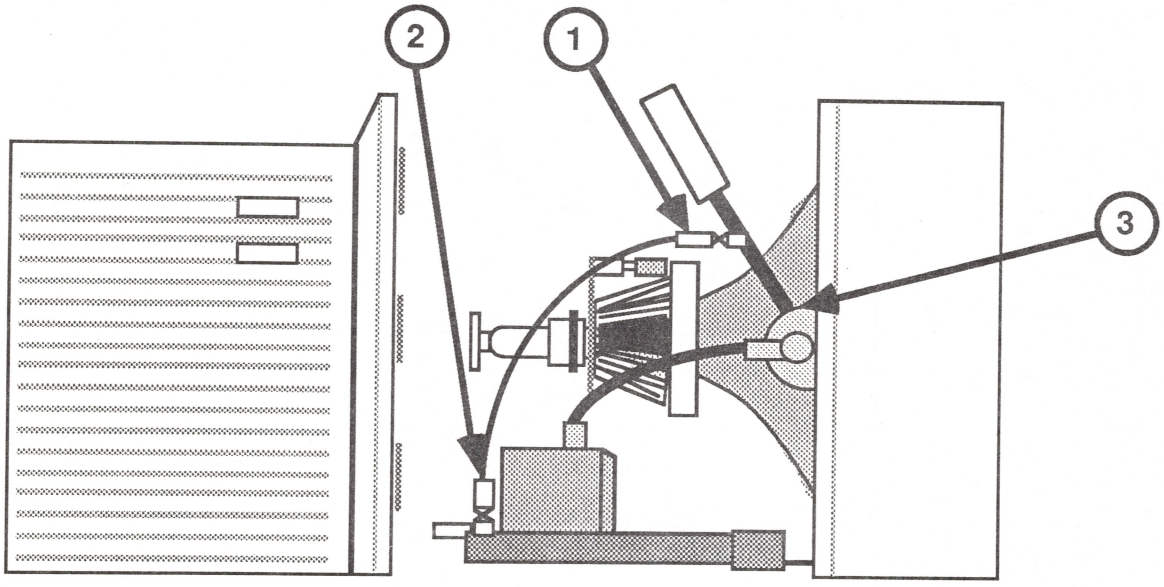

FIGURE 3

❑ DISCHARGING THE CATHODE RAY TUBE (CRT)

Materials Required

Long flatblade screwdriver
12-inch jumper wire with insulated alligator clips
Small flatblade screwdriver
Safety goggles

Procedure

1. Turn off the monitor, disconnect the AC cord from the wall outlet, and disconnect the video cable from the monitor.

2. Remove the rear cover.

3. Set the monitor upright with its back to you.

4. Remove any metal jewelry, (rings, wristwatches, bracelets, hanging necklaces, etc.) and grounding wriststraps.

5. Put on safety goggles.

6. Attach one end of an alligator lead to a long flatblade screwdriver, two inches from the insulated handle (Figure 3, #1). Attach the other end to any part of the metal chassis surrounding the main logic board (Figure 3, #2).

WARNING*: *Use only one hand while discharging the CRT. Grasp only the insulated handle of the screwdriver while discharging the CRT.

7. Slide the screwdriver under the CRT anode cap (Figure 3,# 3) and push it towards the center of the cap until the blade comes into contact with the metal anode ring.

CAUTION*: *Do not use force. If it is difficult to get the screwdriver under the anode cap, use a smaller screwdriver to loosen the suction of the anode cap on the tube. Then proceed to discharge the anode with the larger screwdriver.

8. Remove the screwdriver and disconnect it from the alligator clip.

9. Peel back the anode cap until you can see the anode ring at the center. Look at the metal connector in the center of the cap and notice how it is clipped into the CRT. Push on the cap in one direction and lift the cap off the tube.

   Note: A secondary charge can build up even after you have discharged the CRT. To ensure that any residual charge is dissipated during the service procedure, establish a ground lead by fastening one alligator clip to the metal chassis and the other clip to the edge of the anode aperture.

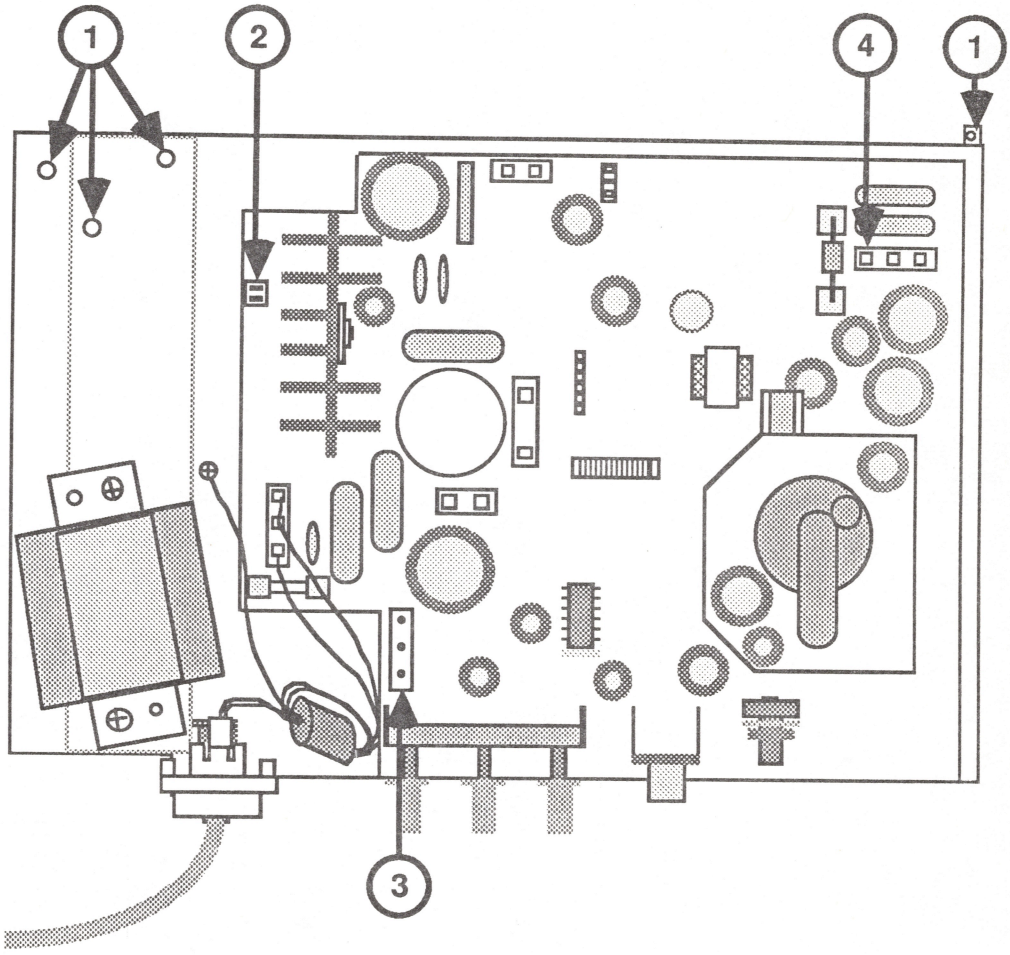

FIGURE 4

❑ MAIN LOGIC BOARD, SWITCH CASE, AND AC CORD

Materials Required

Medium Phillips screwdriver (magnetic)
Diagonal cutters
Safety goggles

Remove

1. Turn off the monitor, disconnect the AC cord from the wall outlet, and disconnect the video cable from the monitor.

2. Remove the rear cover (including front foot).

3. Discharge the CRT.

***WARNING:** In the next step, be careful not to hit the CRT with the screwdriver when removing or replacing the screw nearest the CRT.*

4. Unscrew the four screws (Figure 4, #1) that fasten the main logic board assembly to the CRT mounting plate.

5. Remove wires from the wire clips.

6. Pull the main logic board assembly away from the CRT to give yourself more room to access the connectors.

7. Disconnect the pink/white LED wire (P5) from its connector (Figure 4, #2).

8. Disconnect the green/yellow yoke wire (P3) from the main logic board (Figure 4, #3).

9. Disconnect the red/blue yoke wires (P4) from the board (Figure 4, #4).

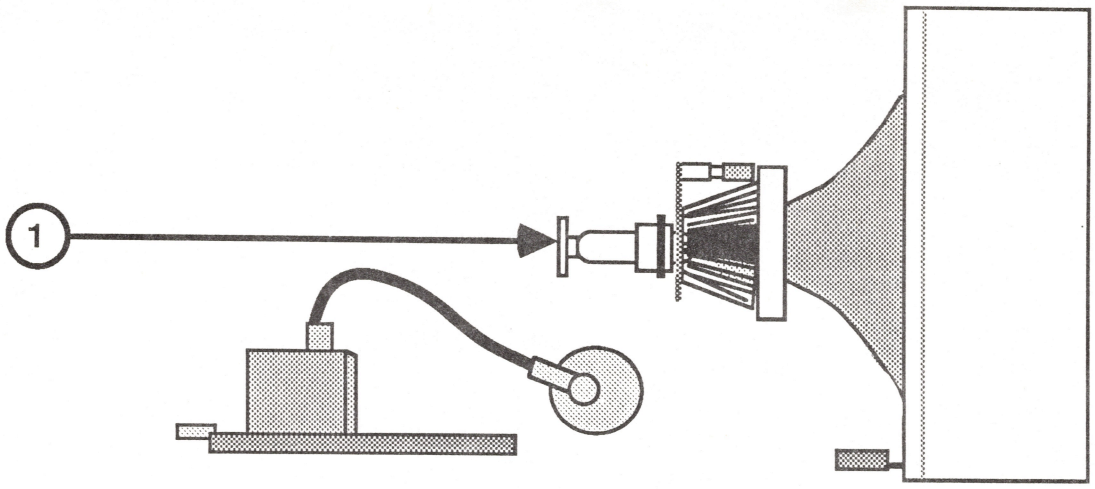

FIGURE 5

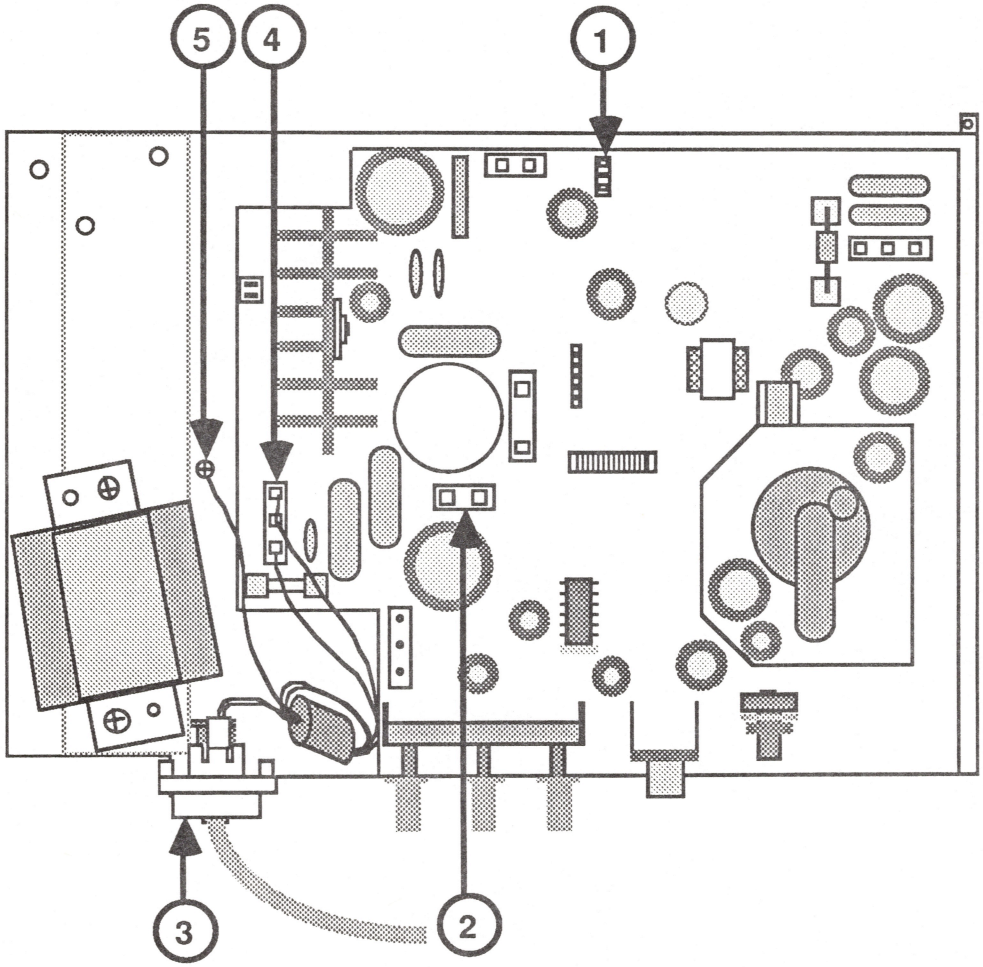

FIGURE 6

10. Gently pull the CRT socket board from the end of the CRT neck (Figure 5, #1).

11. Disconnect the gray ground wire (P6) from its connector on the CRT socket board. Move the logic board away from CRT.

12. The complete assembly consists of the board, the flyback transformer, and the metal chassis that holds them. The transformer is a separate part.

    If you are only removing the main logic board so that you can change the LED or the CRT, leave the switch case, AC cord, and transformer attached to the board.

    If you are replacing the main logic board, remove the adjustment knobs, the switch case, the AC cord, and the transformer before sending the main logic board assembly back to Apple.

Remove Switch Case and AC Cord

1. To remove the switch case from the board:

   a) Disconnect the contrast control connector (P8) from the board (Figure 6, #1).

   b) Disconnect the orange on-off control connector (P7) (Figure 6, #2).

2. To remove AC cord assembly from the board:

   a) Unfasten the screw holding the AC cord mounting plate to the case and lift the mounting plate out of the case (Figure 6, #3).

   b) Cut the tie holding the ferrite core to the case.

   c) Unplug the AC input connector from the main logic board (Figure 6, #4).

   d) Unfasten the green ground wire (Figure 6, #5).

Replace

1. Install the adjustment knobs on the board.
2. Replace the transformer.
3. Set the main logic board close to the CRT unit, with the edge near the tabs and channels it will slide into (Figure 7).

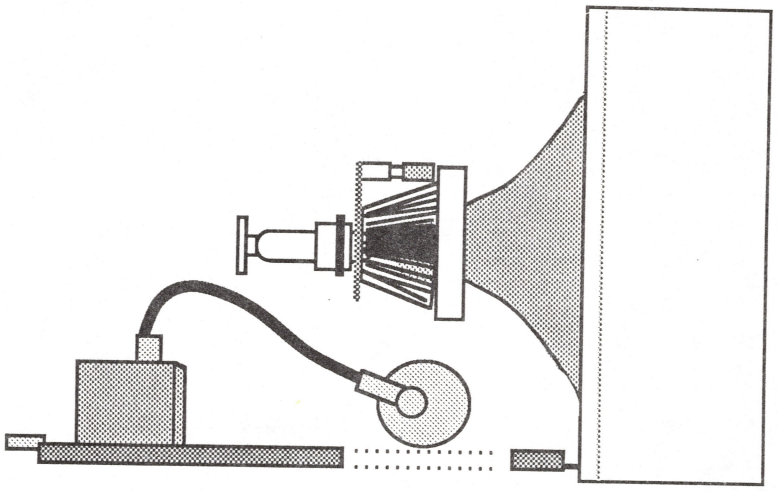

FIGURE 7

4. Reconnect the green/yellow yoke wire (P3) at J3 (Figure 8, #1).
5. Connect the red/blue yoke wire (P4) at J4 (Figure 8, #2).
6. Connect the LED wire at J5 (Figure 8, #3).
7. Connect the contrast control cable at J8 (Figure 8, #4).
8. Connect the orange on-off control wire to J7 (Figure 8, #5).

9. Slide the leading edges of the main logic board assembly carefully inside the metal channels in the CRT mounting plate. Push the edge of the assembly into the tabs in the CRT mounting plate.

***WARNING:** Be careful not to hit the CRT with the screwdriver when replacing or removing the screw closest to the CRT.*

10. Fasten the four screws holding the logic board assembly to the CRT mounting plate (Figure 8, #6).

11. Connect the gray ground lead from the CRT grounding wire to J6 on the CRT socket board.

12. Replace the CRT socket board on the neck of the CRT.

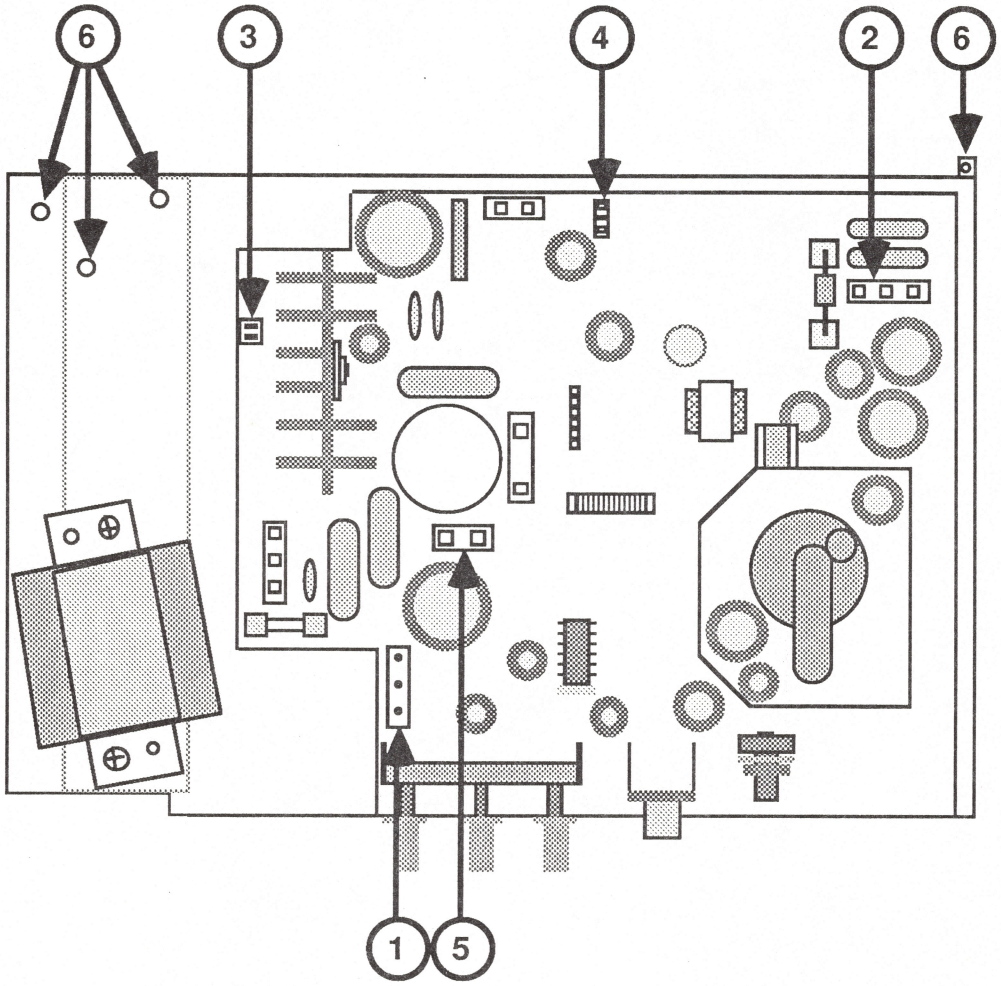

FIGURE 8

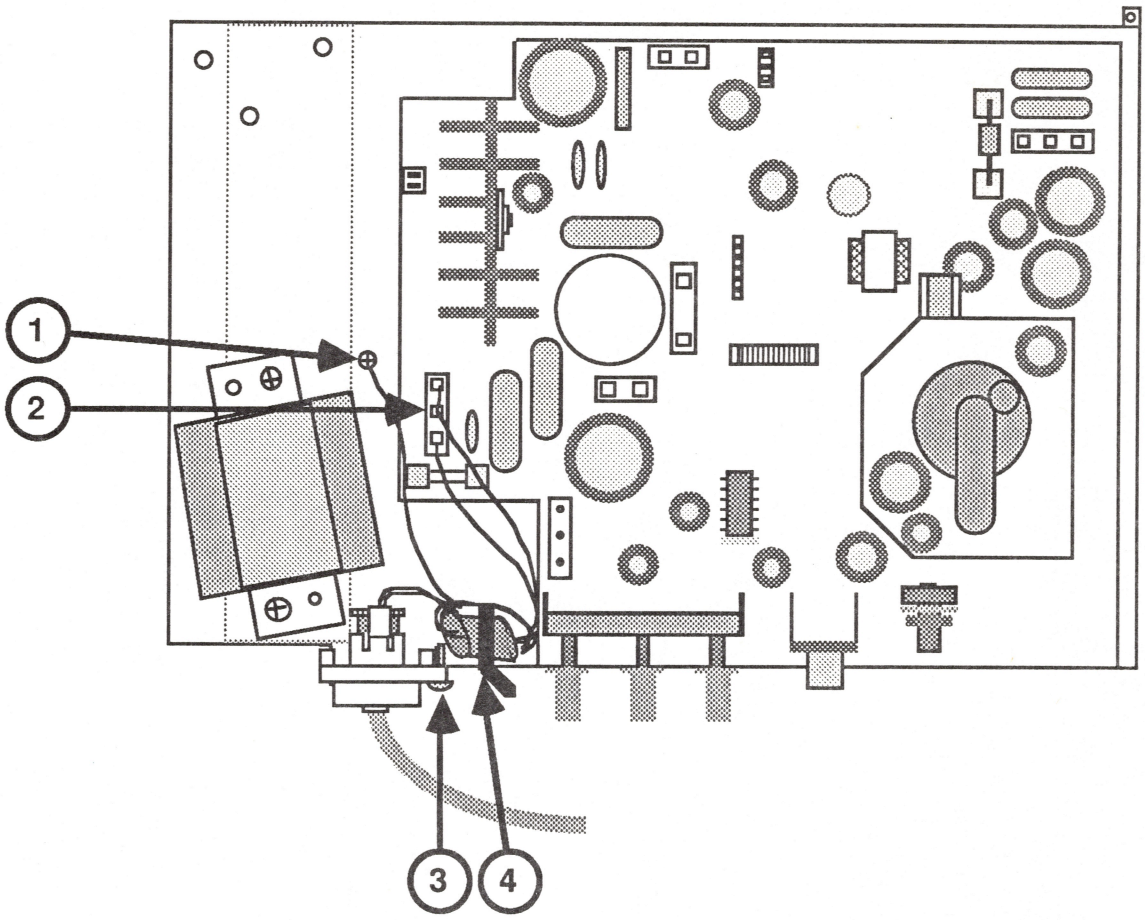

FIGURE 9

WARNING: Reattach the ground wire before making any tests involving power!

13. To reattach the AC cord:

    a) Attach the ground wire to the metal chassis near the transformer (Figure 9, #1).

    b) Plug the connector into the logic board (Figure 9, #2).

    c) Position the plug in back edge of case, and fasten the screw (Figure 9, #3).

    d) Fasten a piece of cable tie around the ferrite core, through the hole in the back edge of the case (Figure 9, #4).

14. Replace wires and cables in plastic clips.

15. If you are finished working inside the case, reconnect the anode cap to the anode of the CRT, making sure that both metal clips are in correctly.

16. To test that connectors P3 and P4 are correctly attached, hook up the monitor and computer, plug them in, and turn them on.

    a) If the image is upside down, turn the computer off and disconnect it. Discharge the CRT. Reverse connector P3.

    b) If the image is reversed, left to right, turn the computer off and disconnect it. Discharge the CRT. Reverse connector P4.

17. Replace the rear cover (includes switch case).

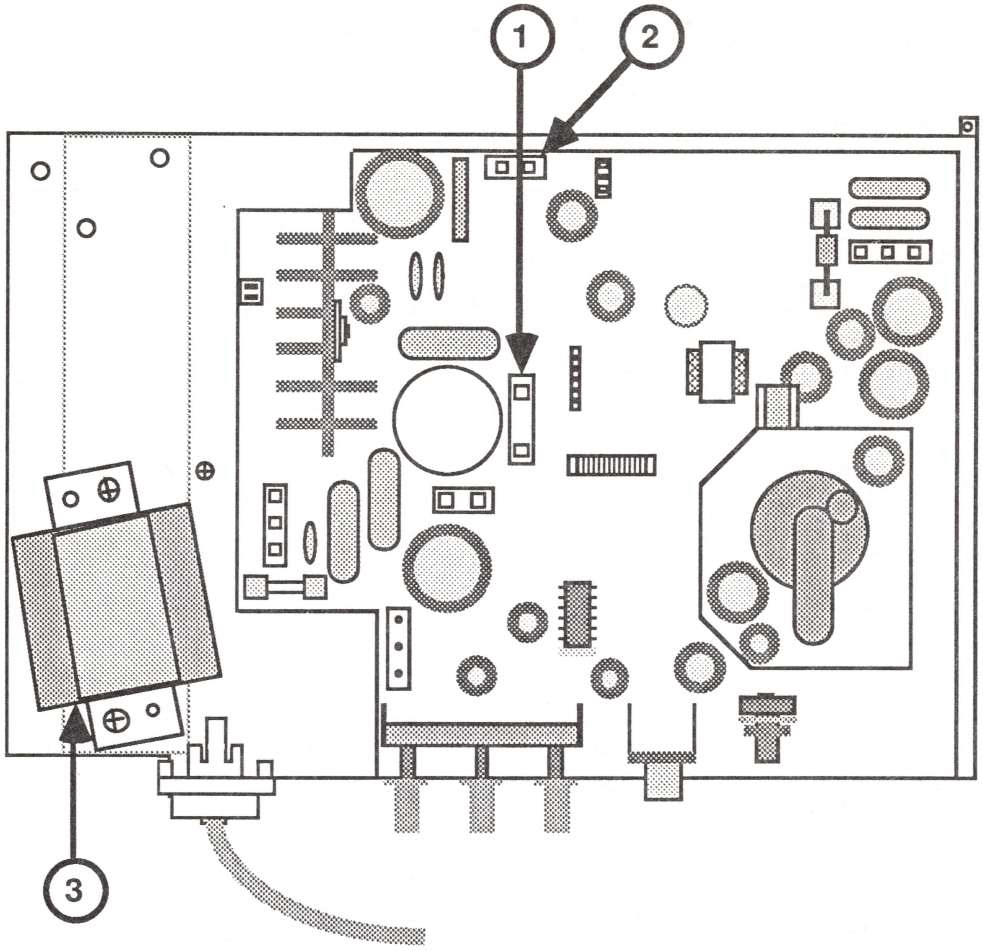

FIGURE 10

❑ TRANSFORMER

Materials Required

Medium Phillips screwdriver (magnetic)
Safety goggles

Remove

1. Remove the rear cover.
2. Discharge the CRT.
3. Remove the main logic board.
4. Disconnect the black and white wires' connector (P1) (Figure 10, #1). (Do not press hard on the board.)
5. Disconnect the blue wires' connector (P2) (Figure 10, #2).
6. Remove the mounting screws for the transformer (Figure 10, #3).
7. Remove the transformer from the main logic board.

Replace

1. Connect P1 at J1 (Figure 10, #1).
2. Connect P2 at J2 (Figure 10, #2).
3. Screw the transformer to the metal chassis.
4. Replace the main logic board.
5. If you are finished working inside the case, reconnect the anode cap to the anode of the CRT, making sure that both metal clips are in correctly.
6. Replace the rear cover.

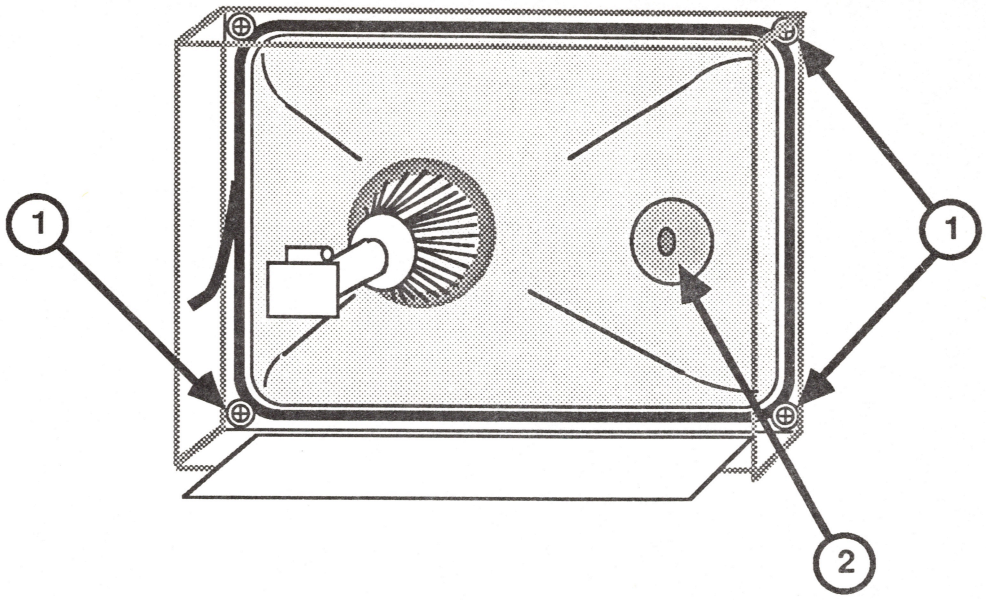

FIGURE 11

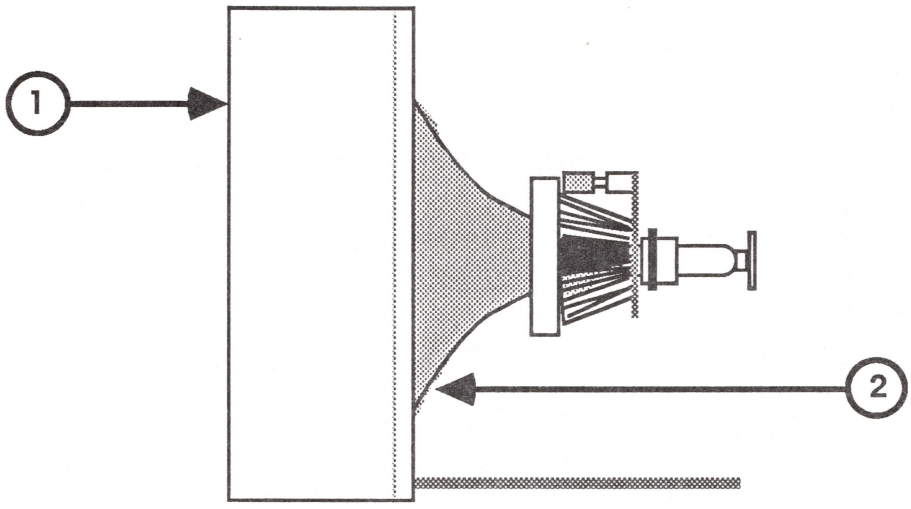

FIGURE 12

❑ CATHODE RAY TUBE (CRT)

The monitor case may flex somewhat as you are sliding the CRT out of it. This is necessary to allow the rim of the CRT to pass the reinforcing bar on the bottom of the case. Protect the CRT rim from the bar as you flex the case.

Materials Required

Medium Phillips screwdriver (magnetic)

Remove

1. Turn off the monitor, disconnect the AC cord from the wall outlet, and disconnect the video cable from the monitor.
2. Remove the rear cover.
3. Discharge the CRT.
4. Remove the main logic board.
5. Place the CRT face down on a soft surface. Remove the mounting screws (Figure 11, #1) from the four corners of the CRT. Avoid touching the anode opening (Figure 11, #2).
6. Stand the monitor upright, supporting it with both hands (Figure 12, #1, and #2).
7. Tip the CRT over so that its weight shifts onto your hand. The CRT mounting plate may also slip out under your hand.
8. Lay the bezel flat and put the CRT down safely.
9. Before throwing away the CRT, devacuum it. (See "Disposing of the CRT" in Section 1, Basics.)

Replace

If the ground wire installed on the new CRT comes off, look at the old CRT to see how to replace it.

1. Place the bezel flat. Slide the edge of the CRT mounting plate into the slots in the front of the case.

2. Push the four rubber mounting feet for the CRT on the spikes in the corners. Fasten with contact cement, if necessary.

***WARNING**: Do not force the rim of the CRT past the reinforcement bar.*

---

3. Holding the CRT in both hands, tip it slightly to slide its top edge under the mounting brackets.

4. Rest the top edge of the tube on its supports, then slip the rest of the CRT assembly into the case. It may be necessary to flex the case slightly.

5. With CRT still face down, replace the screws.

6. Replace the main logic board.

7. Replace the rear cover.

❑ FUSE

Materials Required

Small plastic flatblade screwdriver
Safety goggles

Remove

1. Unplug the AC cord.
2. Remove the rear cover.
3. Discharge the CRT.
4. If the wire inside the fuse is broken, remove the fuse. Insert a plastic adjustment tool or small plastic screwdriver under one metal end and gently pry up until you can pull the fuse out with your fingers.

Replace

1. Be sure you have the correct fuse.
2. Gently press the fuse into the clamp.
3. If you have finished working inside the case, reattach the anode cap.
4. Replace the rear cover.

❑ POWER SWITCH

Materials Required

Medium Phillips screwdriver
Safety goggles

Remove

1. Remove the rear cover and the switch case.
2. Discharge the CRT.
3. Remove the four screws holding the main logic board assembly to the CRT mounting plate.
4. Back the main logic board assembly away from the CRT.
5. Disconnect the switch case from the main logic board by unplugging the power switch connector (P7).
6. On the switch case, unfasten the screw holding the power switch.
7. Unwind the wires from the wire clips, noting how they are wrapped.
8. Pull the button off the shank, and lift the switch out of the case. Keep the button.

Replace

1. Insert the shank through the slot in the switch case. Place the switch so the wires point directly from it to the wire clip.
2. Slip the orange wires between the wire clips on the back of the switch case.
3. Attach the screw.
4. Push the switch button onto the shank (parallel to the contrast knob).
5. Replace rear cover and switch case.

❑ CONTRAST CONTROL

Materials Required

Medium Phillips screwdriver
Flatblade screwdriver
7/16" hex nut driver
Safety goggles

Remove

1. Remove the rear cover and the switch case.
2. Discharge the CRT.
3. Remove the four screws holding the main logic board assembly to the CRT mounting plate.
4. Pull the main logic board assembly away from the CRT.
5. Disconnect the switch case from the main logic board by unplugging the contrast control connector (P8).
6. Slide a flat screwdriver blade through the slots in the switch case and release both the latches that hold the contrast control knob (Figure 13, #1).
7. Swing the wheel section away from the case (Figure 13, #2).

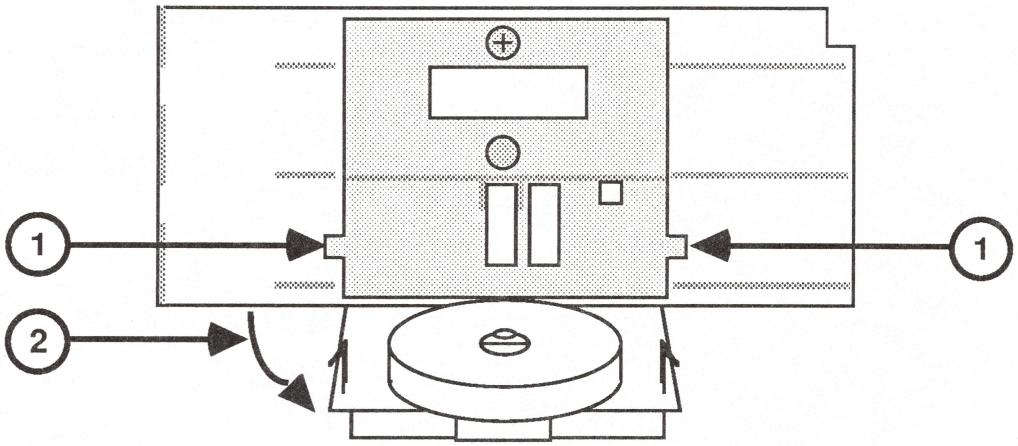

FIGURE 13

8. Slide the contrast control knob off its stem.

9. Remove the nut and washer with a 7/16" hex nut driver.

10. Slide the contrast control stem out of the hole in the switch case.

Replace

1. Remove the nut and washer from the replacement contrast control.

2. Insert the contrast control stem through the hole in the side of the switch case so that the small tab fits into the slot on the side of the switch case.

3. Replace the washer and nut on the stem. Tighten carefully so that the small tab is not twisted out of the slot.

4. Slide the plastic wheel onto the stem with its rim toward the side of case and the flat side of the wheel toward the inside of the case.

5. Close the switch case, snapping both latches shut.

6. Replace the contrast control connector at J8.

7. Fasten the main logic board assembly to CRT mounting plate.

8. Replace the rear cover.

❑ LED ASSEMBLY

Materials Required

Medium Phillips screwdriver
Safety goggles

Remove

1. Remove the rear cover.
2. Discharge the CRT.
3. Remove the main logic board.
4. Remove the CRT.
5. Remove the screw from the LED board. Lift the LED assembly out of the case.

Replace

1. Position the LED assembly so the deflection shield fits inside the rim on the bezel. Fasten the screw.
2. Replace the CRT.
3. Replace the main logic board.
4. Replace the rear cover.

❑ BEZEL

Materials Required

Medium Phillips screwdriver
Safety goggles

Remove

1. Remove the rear cover.
2. Set aside the front foot to install on new bezel.
3. Discharge the CRT.
4. Remove the main logic board.

   Note: If the foot is on, support the CRT carefully until you finish disconnecting.

5. Remove the CRT. Keep the CRT mounting plate for use in the new case.
6. Unfasten the screw that holds the LED assembly.
7. Remove the brackets for the rear cover screws and keep them to install in the new case.

Replace

1. Fasten the mounting brackets into the new bezel.
2. Replace the LED assembly.
3. Replace the CRT.
4. Replace the main logic board.
5. Replace the rear cover.

Apple Technical Procedures

Monochrome Monitor

Section 3 – Adjustments

❑ CONTENTS

3.3 Introduction
3.4 Important Safety Instructions
3.5 Pre-Adjustment Set-Up Procedure
3.5 Materials Required
3.7 Adjustments
3.7 Materials Required
3.7 Sub-Brightness
3.9 Horizontal Hold
3.9 Focus

❑ INTRODUCTION

In exceptional circumstances, the pre-aligned CRT assembly may need adjustment following the replacement of the main logic board or other modules. After any such service, check the text and graphics production by viewing any program generating text and graphics.

Do Not Adjust the Yoke

All yoke adjustments have been preset by the manufacturer. Do not attempt to make any tilt, ring, or geometric adjustments on the Monochrome Monitor. If the customer's monitor has adjustment problems that the following procedures will not correct, use the procedures found in the Troubleshooting Section to isolate the faulty module, and return that module to Apple for repair.

Location of Controls

The contrast control is located on the side of the monitor, beneath the on-off switch. Three other adjustment controls are located on the rear panel of the monitor so that both the dealer and the customer can reach them. The only internal adjustments are sub-bright, horizontal hold, and focus. The focus should **very rarely** need adjustment.

❑ IMPORTANT SAFETY INSTRUCTIONS

***WARNING**: Read and follow the safety instructions below. Failure to follow them could result in electrical shock.*

1. During these adjustments your hand will come close to extremely high voltages on the tube, anode, anode lead, and yoke wires (Figure 1, #1, #2, #3, and #4). Avoid touching these parts.

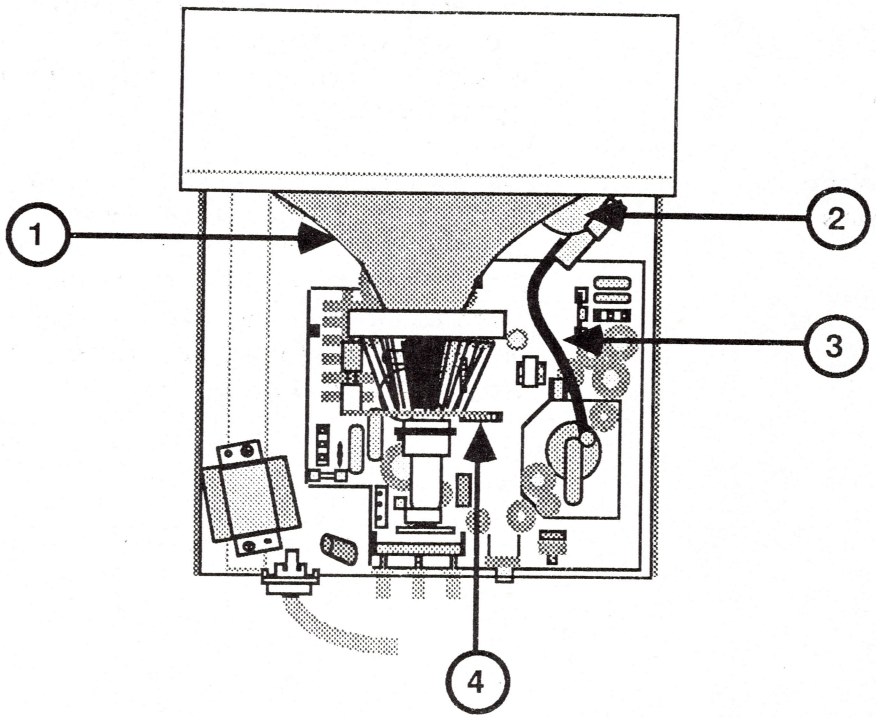

FIGURE 1

2. Use only one hand to make all adjustments! Never touch the chassis while making adjustments.

3. Use only a three-prong, grounded, electrical outlet installed by a qualified electrician, and **do not under any circumstances use an adapter plug**.

4. Do not attempt to make any adjustments on the monitor other than those directed in this section, and do those with extreme caution.

5. Read and follow the additional Safety Precautions in the Basics Section for this product.

❑ PRE-ADJUSTMENT SET-UP PROCEDURE

Materials Required

Apple Monochrome Monitor
Apple IIGS™ or Apple IIe computer
Apple IIGS Diagnostics Diskette (5.25" or 3.5" format)
Mirror with prop (for viewing screen during adjustments)

Procedure

1. Turn the monitor off and disconnect the power cord.

2. Disconnect the video cable from the back of the monitor.

3. Remove the back case. (See Section 2, Take-Apart.)

4. Set the monitor on its feet, reconnect the power cord and video cable, and turn on the monitor and computer.

5. Allow the monitor to warm up for at least 15 minutes.

6. Prop the mirror in front of the screen so that you can see the results of your adjustments as you work.

7. Use **Video Pattern Tests** on the *Apple IIGS Diagnostics Diskette* (see Section 3, Diagnostics, in *Apple IIGS Technical Procedures*,).

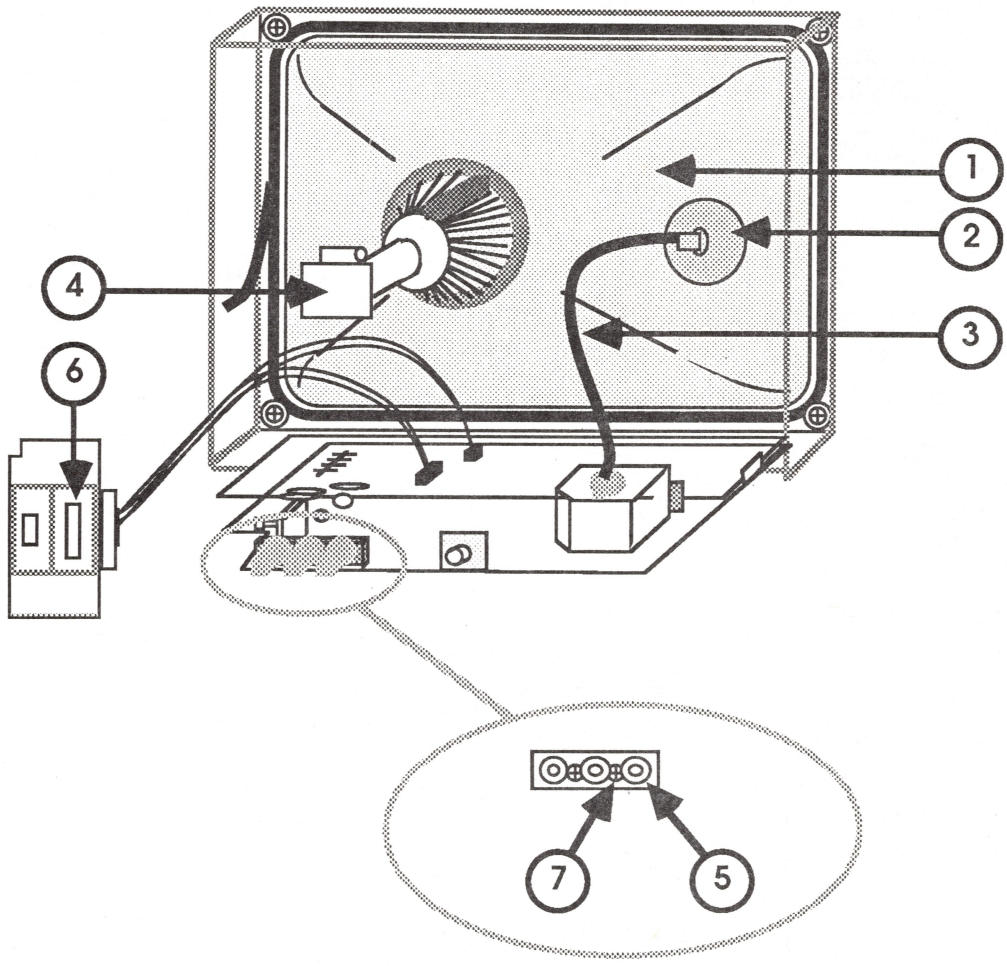

FIGURE 2

❑ ADJUSTMENTS

***WARNING**: There are extremely high voltages on the tube, the anode, the anode lead, and on ends of yoke wires (Figure 2, #1, #2, #3, and #4). DO NOT TOUCH THEM.*
Use only one hand to make all adjustments. Never touch the chassis with your free hand.

Materials Required

Plastic flatblade screwdriver (tweaker)
Apple IIGS Diagnostics Diskette (see *Apple IIGS Technical Procedures*, Section 3, Diagnostics)
Small piece of paper
Pen or soft pencil
Safety goggles

Sub-Brightness

1. Select **Hires Graphics Test** from **Video Tests.**
2. Turn the Brightness knob (Figure 2, #5) to make the screen as bright as possible.
3. Turn the Contrast knob (Figure 2, #6) to make the screen as bright as possible.
4. Using a plastic flatblade screwdriver, turn the Sub-Brightness control (Figure 2, #7) until you can see the slanted raster lines on the screen.
5. Turn the Sub-Brightness control down until the raster lines disappear.
6. Turn both the Brightness and Contrast controls down slightly, to adjust the screen for normal viewing.

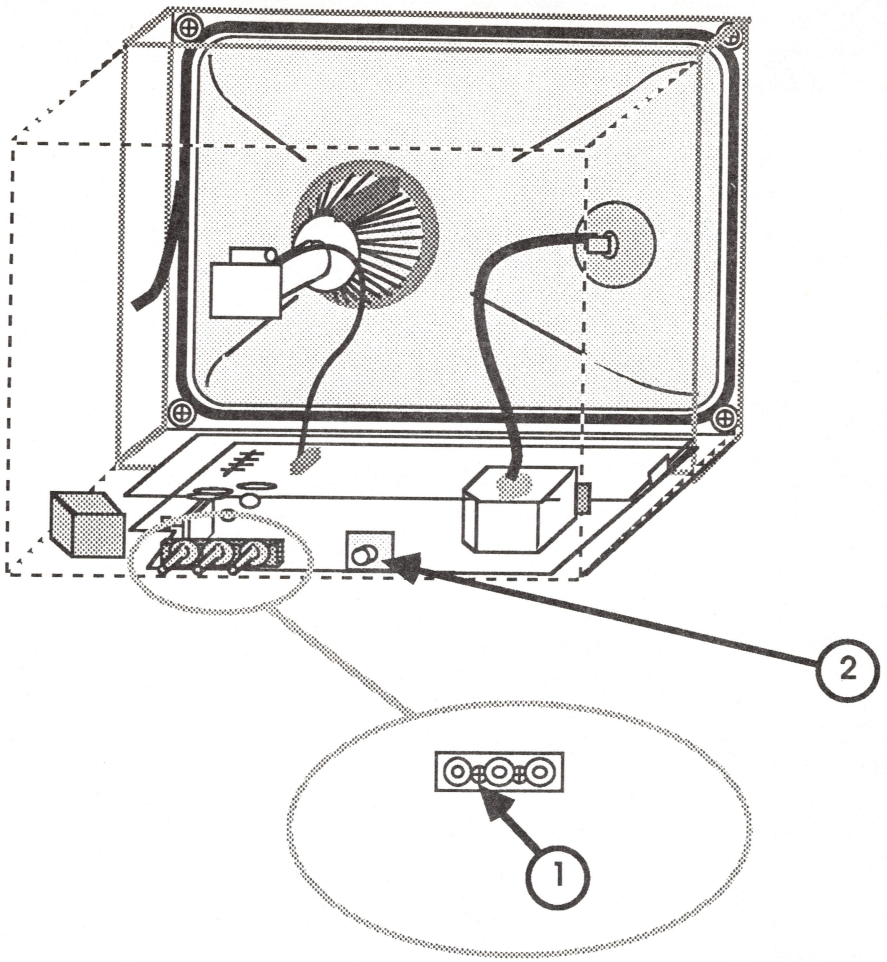

FIGURE 3

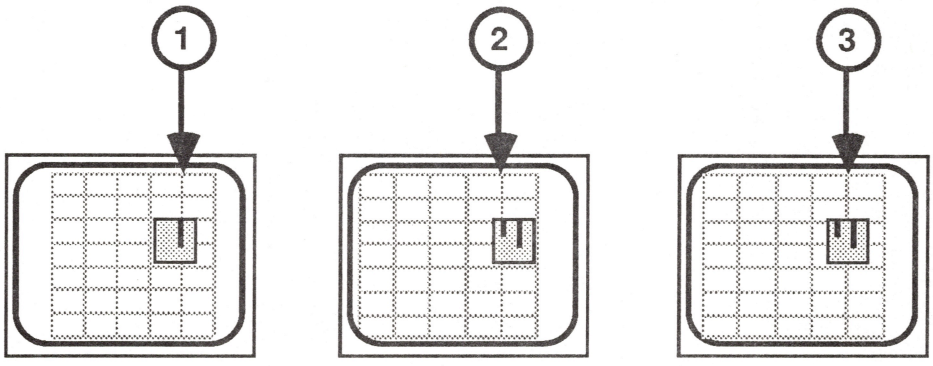

FIGURE 4

Horizontal Hold

1. Select **Hires Graphics Test** from **Video Tests**.
2. Turn the horizontal hold control (Figure 3, #1) **clockwise** until the screen goes out of synchronization.
3. Turn the control **counter-clockwise** until the screen becomes normal.
4. Choose a vertical line as a reference. Tape a piece of paper on the screen and make a mark on it at your reference line (Figure 4, #1).
5. Continue turning the control **counter-clockwise** until the horizontal synchronization again goes bad.
6. Turn the control **clockwise** again to correct the screen condition, and stop.
7. At the point where the synchronization becomes good, mark where your reference line is now. (Figure 4, #2 shows the screen in the mirror.)
8. Turn the horizontal hold control until the vertical line on the screen is halfway between the two marks (Figure 4, #3).

Focus

You should almost never have to adjust this control.

1. Use either display from **40/80 Column Text Test**.
2. Insert plastic flatblade screwdriver (tweaker) in Focus control (Figure 3, #2) and twist slightly to either side to improve focus.
3. If focus does not improve, replace CRT (See Section 2, Take-Apart).

Apple Technical Procedures

Monochrome Monitor

Section 4 – Troubleshooting

❑ CONTENTS

4.2 Introduction
4.2 Monochrome Monitor Symptom Chart

❑ INTRODUCTION

This section contains a symptom chart showing common problems and their solutions. Find the best description of your defective monitor, and then try the recommended actions in the order listed.

If the first corrective action does not solve the problem, put back the original module or part before trying the next action.

❑ MONOCHROME MONITOR SYMPTOM CHART

• *No power (LED doesn't light)*	1. Check fuse; replace if blown. If it blows again, replace transformer. 2. Replace transformer. 3. Replace power switch.
• *No raster*	1. Check that video cable is securely connected. 2. Adjust the external brightness control on the back of the case. 3. Adjust the contrast control. 4. Check that all connectors are secure on the CRT board and the main logic board. 5. Replace main logic board. 6. Replace CRT.
• *One vertical raster line appears*	1. Replace main logic board. 2. Replace CRT assembly.
• *Raster deformed*	- Replace CRT assembly.
• *Wavy picture*	- Replace main logic board.
• *Spot remains with unit off*	- Replace main logic board.
• *Brightness range abnormal*	1. Replace main logic board. 2. Replace power transformer.

- *Raster size small, picture abnormally bright* - Replace main logic board.
- *No vertical synchronization* - Replace main logic board.
- *Screen bright, no picture* - Replace main logic board.
- *15 or more seconds for picture to appear* - Change CRT assembly.
- *Picture appears and disappears*
  1. Replace main logic board.
  2. Replace CRT assembly.
- *Out of focus* - See "Focus" in Section 3, Adjustments.
- *Won't focus*
  1. Replace main logic board.
  2. Replace CRT.
- *Narrow raster* - Replace main logic board.
- *Picture compressed or stretched out* - Replace main logic board.
- *Picture tears* - See "Horizontal Synchronization" in Section 3, Adjustments.
- *Image reversed (after servicing)* - Yoke connector (P4) is plugged in backwards.
- *Image inverted (after servicing)* - Yoke connector (P3) is plugged in backwards.

Apple Technical Procedures

Monochrome Monitor

Section 5 – Illustrated Parts List

❑ CONTENTS

5.3 Rear Cover Assembly (Figure 1)
5.5 CRT, Main Logic Board, and Transformer (Figure 2)
5.7 Bezel Assembly (Figure 3)
5.9 Other Parts (Figure 4)

The figures and lists in this section include all piece parts that can be purchased separately from Apple for the Apple Monochrome Monitor, along with their part numbers. These are the only parts available from Apple. Refer to your *Apple Service Programs Manual* for prices.

Note: Screw/Knob Set parts are included where applicable on Figures 1-3.

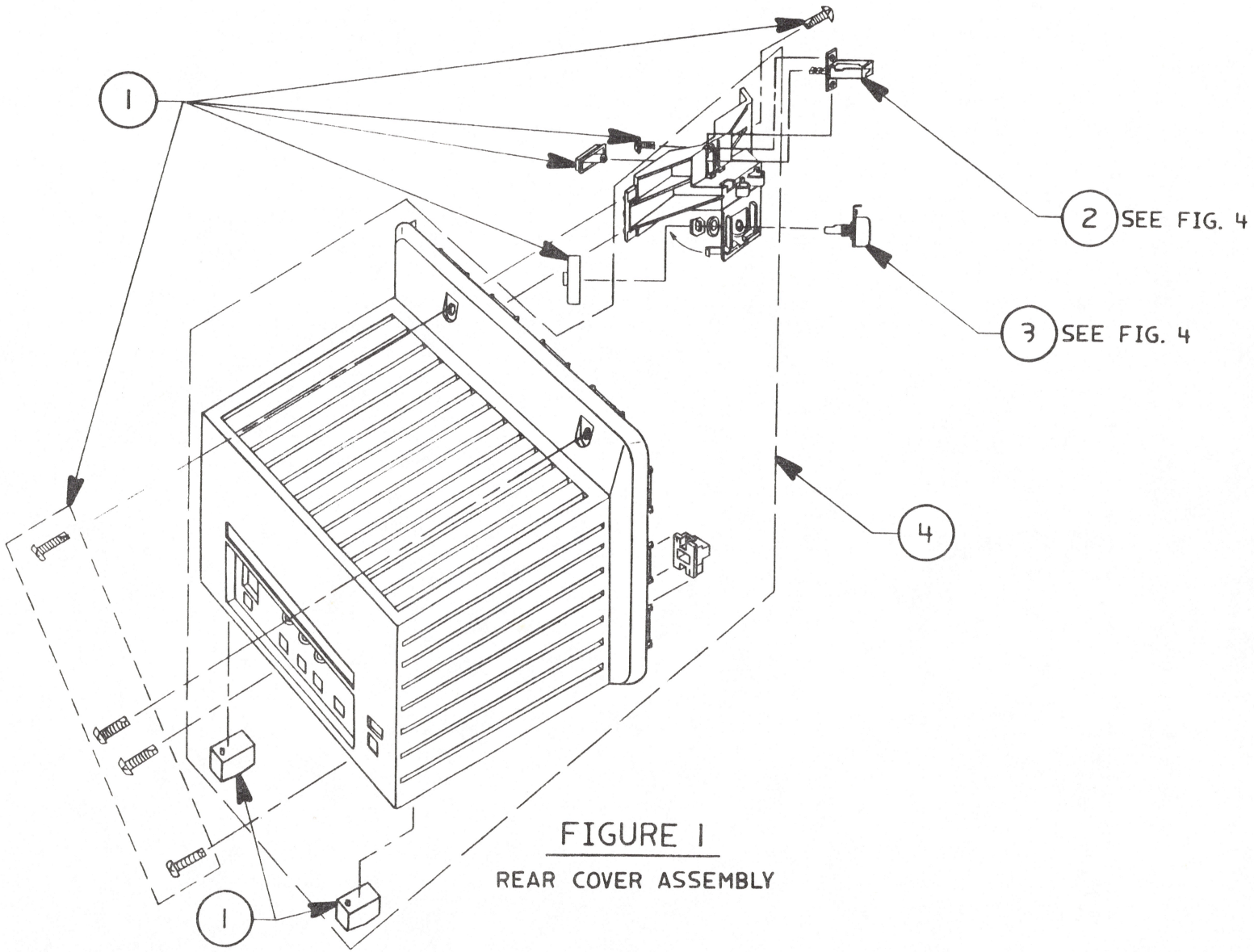

FIGURE 1

REAR COVER ASSEMBLY

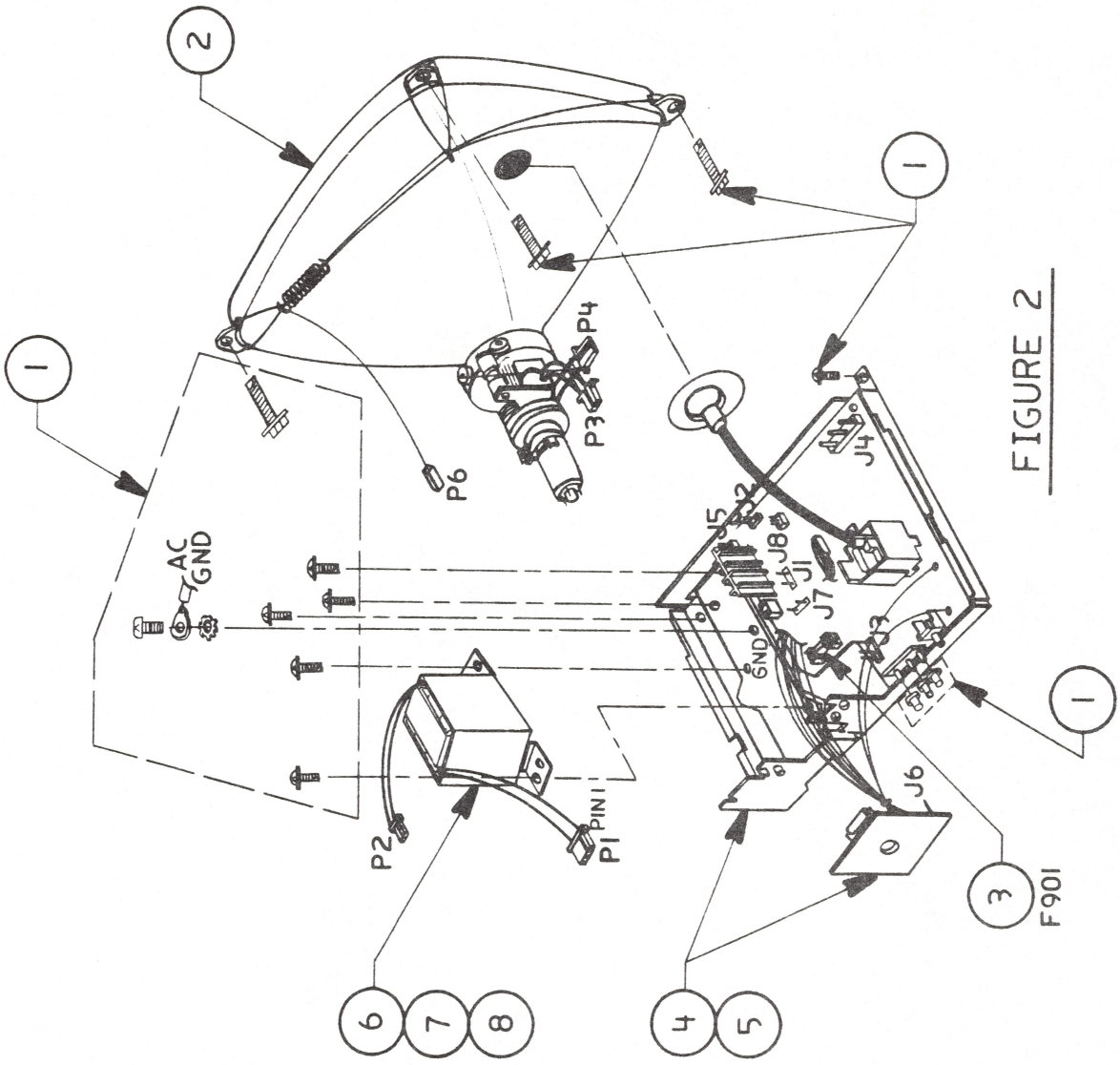
2
1
1
P4
P3
P6
J4
J5
J8
J1
J7
AC
GND
GND
J3
P2
PIN 1
P1
J6
1
3
F901
6
7
8
4
5

FIGURE 2

❑ MONOCHROME MONITOR – REAR COVER ASSEMBLY (Figure 1)

Item	Part No.	Description
1	956-0004	Screw/Knob Set (See also Figures 2 and 3.)
2	937-0018	On/Off Switch
3	905-0002	Contrast Control
4	949-0068	Rear Cover Assembly

❑ MONOCHROME MONITOR – CRT, MAIN LOGIC BOARD, AND TRANSFORMER (Figure 2)

Item	Part No.	Description
1	956-0004	Screw/Knob Set (See also Figures 1 and 3.)
2	076-0224	CRT
3	740-0308	Fuse
4	661-0346	Main Logic Board, 110v
5	661-0362	Main Logic Board, 220/240v
6	915-0009	Transformer, 110v
7	915-0010	Transformer, 220v
8	915-0011	Transformer, 240v

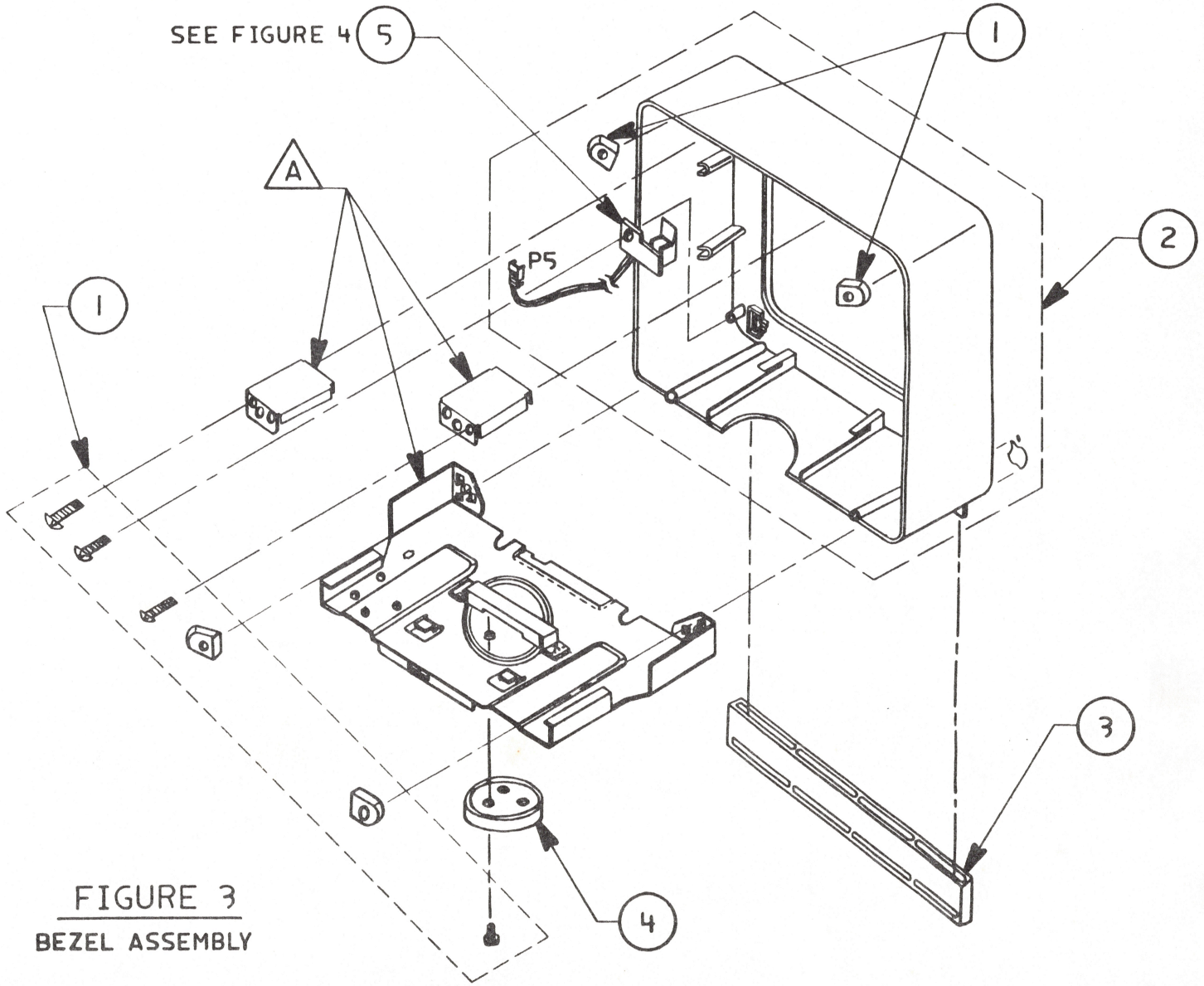

FIGURE 3
BEZEL ASSEMBLY

❑ MONOCHROME MONITOR – BEZEL ASSEMBLY (Figure 3)

Item	Part No.	Description
1	956-0004	Screw/Knob Set (See also Figures 1 and 2.)
2	949-0067	Bezel Assembly
3	949-0056	Front Foot
4	949-0057	Bottom Plate
5	930-0005	LED Assembly

Note: The items marked *A* are not available from Apple. If a new bezel is required, these parts must be retained from the old bezel and reinstalled in the replacement bezel.

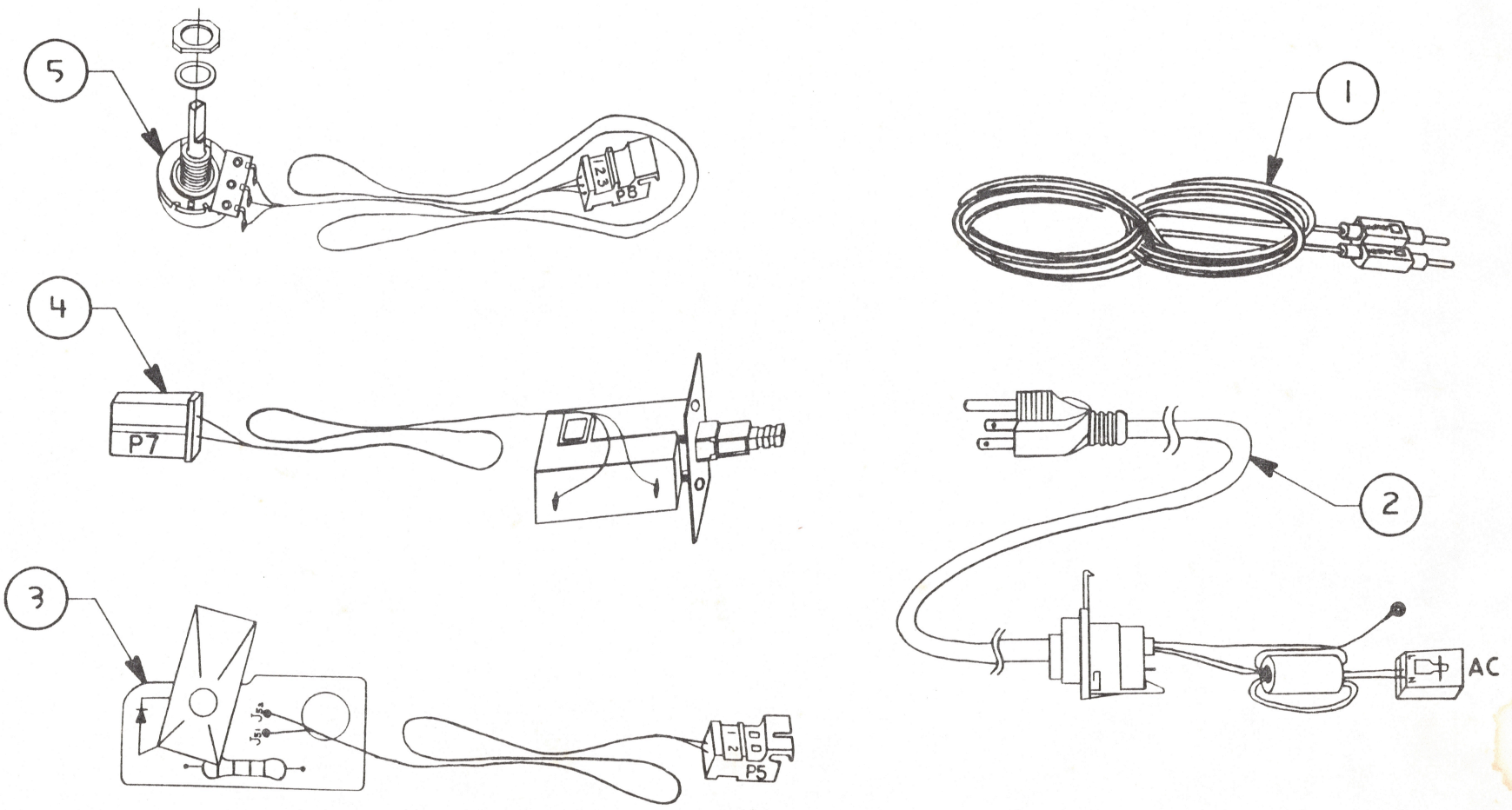

FIGURE 4

❑ MONOCHROME MONITOR – OTHER PARTS (Figure 4)

Item	Part No.	Description
1	590-0539	Video Cable, Smoke
2	935-0003	AC Cord
3	930-0005	LED Assembly
4	937-0018	On/Off Switch
5	905-0002	Contrast Control